DOCUMENT RESUME

ED 296 142 CE 050 429

AUTHOR Everett, Donna R.
TITLE Competencies for Information Systems Workers.
PUB DATE 88
NOTE 253p.; Ed.D. dissertation, University of Houston.
PUB TYPE Dissertations/Theses - Doctoral Dissertations (041) -- Tests/Evaluation Instruments (160)

EDRS PRICE MF01/PC11 Plus Postage.
DESCRIPTORS *Business Skills; *Communication Skills; Employment Qualifications; Entrepreneurship; *Information Systems; *Interpersonal Competence; *Job Skills; Office Automation; *Office Occupations Education; Problem Solving

ABSTRACT

A study examined the knowledge, skills, and attitudes essential for information systems workers. The listing of competencies was developed after an extensive literature review, interviews with educational professionals and persons employed in information occupations, and input from a Developing a Curriculum (DACUM) committee of 16 information systems experts. The questionnaire thus developed was mailed to 1,017 members of the Association of Information Systems Professionals. Responses were obtained from 657 participants (64.6 percent). A second-round questionnaire consisting of 318 competency statements in eight broad skill areas was then completed by 475 (72.3 percent) of the participants from round 1. Both a Delphi analysis and an Analysis of Distinction indicated that all eight broad skill areas were rated as essential competencies for information systems workers. Of the 290 items deemed essential or very important, 213 (73.45 percent) were in the communications, interpersonal, and technological skills categories. The other four skill areas--management, problem-solving, entrepreneurial, and business skills--also accounted for essential competencies for information systems workers. (Appendixes include the two occupational competencies surveys, a demographics datasheet, and a list of respondents by state.) (MN)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED 296142

COMPETENCIES FOR INFORMATION SYSTEMS WORKERS

Donna R. Everett

University of Houston
Ed.D. Dissertation

1988

CE 050 429

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☑ This document has been reproduced as received from the person or organization originating it

☐ Minor changes have been made to improve reproduction quality

- Points of view or opinions stated in this document do not necessarily represent official OERI position or policy

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

D. Everett

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

Copyright

by

Donna R. Everett

May 1988

BEST COPY AVAILABLE

COMPETENCIES FOR INFORMATION SYSTEMS WORKERS

A Dissertation Presented to the
Graduate Faculty of the College of Education
University of Houston

In Partial Fulfillment
of the Requirements for the Degree

Doctor of Education

by

Donna R. Everett

May 1988

COMPETENCIES FOR INFORMATION SYSTEMS WORKERS

A Dissertation for the Degree
Doctor of Education

by

Donna R. Everett

Approved by dissertation committee:

BR Herrscher
Dr. Barton R. Herrscher, Co-Chair

Kenneth W Brown
Dr. Kenneth W. Brown, Co-Chair

Sharon Lund O'Neil
Dr. Sharon Lund O'Neil, Committee Member

R S Randall
Dr. Robert S. Randall, Committee Member

William Georgiades
Dean, College of Education

May 1988

ACKNOWLEDGEMENTS

The present study was made possible through the efforts of the following special persons:

Dr. Kenneth W. Brown: Co-chair, department chair, and guru *par excellence*. Gratitude is expressed for his patience, advice, support, and friendship. Without his encouragement and suggestions this study would not have been possible.

Dr. Barton R. Herrscher: Co-chair, advisor, and master teacher *extraordinaire*. This researcher and student has acquired insight and appreciation for the role that the teacher plays in a student's life because of his example. His commitment to students and his field go far and above what is expected.

Dr. Sharon Lund O'Neil: Committee member and mentor *suprema*. A deep and lasting friendship has been forged with Dr. O'Neil because of the way that she has given herself and her guidance to this researcher. This study would not have been possible without her wise and selfless counsel. Words do not adequately express the appreciation for her time and support. One can only hope "to go and do likewise".

Dr. Robert S. Randall: Committee member and statistician *bravissimo*. Appreciation is expressed and extended to Dr. Randall for giving his time and advice in the statistical design and presentation of the study.

Members of the DACUM panel and the participants from the Association of Information Systems Professionals: Appreciation is expressed for taking the time to complete a long and tedious questionnaire. The researcher hopes the results are well worth their efforts.

Members of my family: My deepest thanks go to my husband, Marshall, my daughter, Melinda, and my mother, Sue Raney. Many times they were asked to change their plans, tiptoe around the house, and "fend" for themselves while this study was being created and refined. They never complained and were always supportive. You are the greatest!

COMPETENCIES FOR
INFORMATION SYSTEMS WORKERS

An Abstract
of
A Dissertation Presented to the
Graduate Faculty of the College of Education
University of Houston

In Partial Fulfillment
of the Requirements for the Degree

Doctor of Education

by

Donna R. Everett

May 1988

Everett, Donna R. "Competencies for Information Systems Workers." Unpublished Doctor of Education Dissertation, University of Houston, May 1988.

Abstract

Purpose

The present study was conducted to identify competencies--knowledges, skills, and attitudes--essential for information systems workers. Information systems competencies should permit workers to successfully maintain and compete for positions in information occupations.

Method

An initial listing of competencies was developed through the following procedures: an extensive review of related literature; a search of off-line and on-line library sources; interviews with a variety of workers, research authorities, and information systems professionals; input from state directors and programs directors; and an analysis of model curricula.

Next, a DACUM (Developing A CurriculUM) committee, composed of sixteen information systems experts, determined broad skill areas and supporting task statements. The broad component areas were identified as follows: BUSINESS SKILLS, COMMUNICATIONS SKILLS, INTERPERSONAL SKILLS, MANAGEMENT SKILLS, PROBLEM SOLVING SKILLS, INTRAPRENEURIAL SKILLS, and TECHNOLOGICAL SKILLS. An eighth category, GENERAL EDUCATION SKILLS, was identified; no competency statements were developed separately for this category.

From this list of components and competencies, the Information Systems Occupational Competencies Questionnaire was formatted. A four-point Likert-type scale was employed which required a response in one of four ways: 4 = ESSENTIAL, 3 = VERY IMPORTANT, 2 = SOMEWHAT IMPORTANT, and 1 = NON-ESSENTIAL. Part I of the questionnaire identified the eight broad skill areas listed above; Part II of the questionnaire included the basic competencies (tasks) within each of the broad component areas. The DACUM panel was used to pilot test and refine the questionnaire.

The Delphi technique was utilized to achieve consensus among experts in this study. Experts in this study were identified as nationwide members of the Association of Information Systems Professionals (AISP). Two iterations of the Information Systems Occupational Competencies Questionnaire were employed to collect the data, as follows: (1) Round One of the questionnaire consisted of 8 broad skill areas and 304 competency (task) statements and was mailed to 1,017 AISP members. Responses were obtained from 657 (64.60%) panelists. They were invited to list other important competencies and add comments. (2) Round Two of the questionnaire consisted of 8 broad skill areas and 318 competency (task) statements due to respondent input. Responses were obtained from 475 (72.30%) of the participants from Round One.

Results

The inmates working in the Records Conversion Facility at the Wynne Unit of the Texas Department of Corrections in Huntsville, Texas, were equipped to handle large data-entry projects of this kind. The data from the two questionnaires were entered onto computer tapes and downloaded at the University of Houston Computing Center onto the AS-9000N computer.

The statistical analysis of the data was accomplished in two ways: the "pure" Delphi analysis with the reporting of medians and interquartile ranges, and an Analysis of Distinction which featured the rank ordering of the means for each component and competency (task) statement. In the Delphi analysis, the criterion for an essential competency for information systems workers was an "Essential" or a "Very Important" rating in Round Two. In the Analysis of Distinction, an item was considered "Essential" if it received a mean rating of 3.51 or above; an item was considered "Very Important" if it received a mean rating of 2.51-3.50; an item receiving a mean rating of 2.50 or below was considered "Somewhat Important" for information systems workers.

In both the Delphi analysis and the Analysis of Distinction, all eight broad skill areas were rated as essential competencies for information systems workers. Stronger agreement was reached by the respondents in both analyses that BUSINESS SKILLS, INTERPERSONAL SKILLS, and GENERAL EDUCATION SKILLS were essential.

Of the 318 task items, 286 (88.94%) were rated "Essential" or "Very Important" and were considered necessary competencies for information systems workers in the Delphi analysis. Three skill areas, INTERPERSONAL SKILLS, COMMUNICATIONS SKILLS, and TECHNOLOGICAL SKILLS, accounted for 160 (55.94%) of the 286 essential competencies. Stronger agreement by the respondents, as evidenced by group consensus, was achieved on 162 (50.94%) of the 318 items. The strongest agreement again was evident in the three skills areas of COMMUNICATIONS SKILLS, INTERPERSONAL SKILLS, and TECHNOLOGICAL SKILLS.

Of the 318 task items, 58 (18.24%) of the competencies obtained means of 3.51 or above and were considered "Essential"; 232 (72.96%) of the competencies obtained means of 2.51-3.50 and were considered "Very Important"; and 30 (9.62%) of the competencies obtained means of 2.50 or below and were considered "Somewhat Important". Of the 290 items which were considered "Essential" or "Very Important", 213 (73.45%) were in the COMMUNICATIONS SKILLS, INTERPERSONAL SKILLS, and TECHNOLOGICAL SKILLS categories.

The other four skill areas--MANAGEMENT SKILLS, PROBLEM SOLVING SKILLS, INTRAPRENEURIAL SKILLS, and BUSINESS SKILLS--also accounted for essential competencies for information systems workers.

Conclusions

Based on the results from the present study, each of the eight broad skill areas can be considered to have some degree of importance for information systems workers. The most essential competencies appear to be those associated with interpersonal skills, human communications skills, and technological skills. It is important to note also that GENERAL EDUCATION SKILLS were essential for information systems workers.

It would appear that organizational, ethical, managerial, problem solving, and change and risk skills are essential for information systems workers, also.

TABLE OF CONTENTS

CHAPTER Page

I INTRODUCTION 1

Importance of the Problem 1
Statement of the Problem 5
Purpose of the Study and Research Questions 6
Significance of the Research 7
Delimitations of the Study 9
Limitations of the Study 10
Assumptions 10
Definition of Terms: General 11
Definition of Terms: Survey Components 13
Format of the Study 14

II REVIEW OF RELATED LITERATURE 16

Information Systems Skills for the Automated Office 17
  Organizational Elements 18
  Human Elements 23
    General Education 24
    Business Skills 26
    Management Skills 29
    Interpersonal Skills 30
    Communications Skills 33
    Human Concerns 34
  Technological Elements 36
  Summary 40

Discussion of Methodology 42
  The DACUM Committee 42
    The DACUM Approach 42
    The Delphi Technique 45
    Quality of Delphi Instrument 46
    Selection of the Delphi Respondents 49
    Commitment of Respondents 49
    Size of the Delphi Panel 50
    Number of Rounds Needed to Reach Consensus 51
  Summary 54

CHAPTER Page

III METHODOLOGY 55

Instrumentation 56
Preliminary Data Collection 56
The DACUM Committee 57
Development of the Information Systems Occupational Competencies Questionnaire 59
Pilot Test 61
Study Population 62
Data Collection 63
Data Analysis 64

IV PRESENTATION AND ANALYSIS OF DATA 68

The Delphi Analysis 68
Response Rate 68
Basic Components 69
Basic Competencies (Tasks) 73
Business Skills 73
Communications Skills 77
Interpersonal Skills 84
Management Skills 87
Problem Solving Skills 91
Intrapreneurial Skills 93
Technological Skills 96
Prerequisite Skills 109
Level of Employee 111
Summary of Delphi Analysis 113

Analysis of Distinction 115
Summary of Analysis of Distinction 132

V SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS .. 134

Overview of Study 134
Summary of Methods and Database Sources 135
Summary of Results 137
Basic Components 137
Business Skills 137
Communications Skills 138
Interpersonal Skills 140
Management Skills 141
Problem Solving Skills 142
Intrapreneurial Skills 142
Technological Skills 143
Prerequisite Skills 144
Level of Employee 144

CHAPTER Page

V Conclusions 145
Recommendations 148

REFERENCES 154

APPENDIX

A LIST OF DACUM COMMITTEE MEMBERS 166

B LETTERS TO DELPHI PANELISTS 168

C INFORMATION SYSTEMS OCCUPATIONAL COMPETENCIES SURVEY #1 173

D INFORMATION SYSTEMS OCCUPATIONAL COMPETENCIES SURVEY #2 196

E DEMOGRAPHICS DATASHEET 219

F LIST OF RESPONDENTS BY STATE 233

LIST OF TABLES

TABLE Page

1 Number and Percentage of Responses for Rounds One and Two 69

2 Basic Components 71

3 Business Skills 74

4 Communications Skills 78

5 Interpersonal Skills 85

6 Management Skills 88

7 Problem Solving Skills 92

8 Intrapreneurial Skills 94

9 Technological Skills 98

10 Prerequisite Skills 110

11 Level of Employee 112

12 Analysis of Distinction: Mean Ranking of Basic Components 116

13 Analysis of Distinction: Mean Ranking of Competencies (Tasks) 118

CHAPTER I

INTRODUCTION

IMPORTANCE OF THE PROBLEM

Even as these words are being written, changes are occurring in technology which will affect how the office--generally where information is the key product--will handle work, how workers will perform the work, and how the organization will be structured to manage the work. These changes are primarily due to the increasing demand for information and the need of business and industry to control the flow of information in an ever-competitive world market. The challenge of accessing, manipulating, and processing data into usable information for effective decision making will become even more critical as the amount and availability of data increase. Information refers to data which may be text, voice, numbers, image, graphics, or other forms for purposes of interpretation (Michael, 1984, p. 348).

The forces in office automation focus on significant technological developments, such as the integration of the personal computer, communication networks, and information handling tools. Put all of these tools together and the outcome is an integrated office system, designed to deliver information to the right person at the right time for effective decision making.

Simultaneously, an acute need exists to augment the productivity and effectiveness of white-collar workers. According to a Stanford Research Institute study, between 1960 and 1970, industrial worker productivity in the United States rose 83 percent while white-collar productivity increased only 4 percent (Purchase and Glover, 1976). While the nature of the work done by white-collar workers may not be so precisely measurable as work done by factory workers, it is recognized that the office is a very labor-intensive environment which can be improved by the wise application of new technologies. The momentum of "technology push" and "demand pull" represent the driving forces behind changes in the office (Tapscott, 1982, pp. 2, 5).

Along with the challenge to harness the information and technology explosions and to meet the demand for increased office worker productivity is the need to control the spiralling costs of office work. Bailey, Gerlach, and Whinston (1985) have stated:

> Administrative costs are increasing faster than manufacturing costs and there is no indication that the trend is slowing down. The labor-intensive nature of office work and the steadily increasing costs of labor...which have risen from 20% to 30% of total company costs to 40% to 50% of total company costs in recent years largely explain office cost increases... (p. 4).

Increased productivity and decreased office costs will be enhanced by providing tools whereby office workers can become more efficient and effective. These tools, however, will be effective only in the hands of competent workers.

Alvin Toffler (1980) and John Naisbitt (1982) address the shift from an industrial society to an information society as one of the major transformations that has taken place in the twentieth century. The shift from the focus on manufacturing to the processing of information is having an effect on the organizational structure. Drucker (1986) describes the change in the structure of the organization as one in which "information serves as the axis and as the central structural support" (p. 203).

The key to the transition from an industrial economy to an information economy has been the computerization and automation of the work functions. Often the word "revolution" is used to describe the impact of the computer, more specifically the microcomputer, because it not only connotes change, but it also implies rapid, if not violent, change (DeVore, 1982, p. 9). The increasingly sophisticated tools which enable information to be produced, processed, stored, and transferred are affecting job design, work group structures, and individual and organizational performance. Rumberger and Levin (1985) state that

> this transformation is part of a continuing process of technological change that has been going on throughout the nation's history. Past technical developments reduced the labor requirements of farming and transformed work in the factory. Today's rapid developments in microelectronics, biological sciences, and other "high-tech" areas are

> transforming work in virtually all sectors of the economy (p. 399).

The attention and emphasis given to the emergence of an information society has focused on the fact that larger percentages of the work force are involved with manipulating information--facts, figures, and speculations--not objects (Bikson and Eveland, 1986, p. 1). Information is becoming the organizing energy with the capital resource being knowledge (Drucker, 1986, p. 325). In order to enter into and advance within information work, new job skills are emerging and old ones are becoming obsolete.

White-collar workers, which include managerial, professional and technical, secretarial and clerical, and sales workers, are now being referred to as "information workers" by the Bureau of Labor Statistics, and make up the majority of the work force which exceeded 55 million in 1985. This category is expected to grow by another 5 million in 1990 and top 65 million in 1995 (U. S. Department of Labor, 1983). Since an increasingly larger proportion of the work force will be involved in the processing of information, there will be a profound effect on the primary locus of information work: the office.

The traditional definition of "office" as the focal point for the origin of business transactions is changing as computer-based technology allows geographically dispersed individuals and work groups to jointly carry out tasks which handle information. As information technology continues to change the way that work in the office is accomplished, the concept of an office as a location may become secondary to the concept of an office as a system of people working together (Bikson and Eveland, 1986, p. 3).

With the proliferation of electronic technology into the office and ensuing changes in procedures and work flow, there is a concern for availability of workers possessing the requisite fundamental skills to succeed in today's office. Roessner (1985) states that industry representatives seem to agree that all office workers, managers and clerical alike, will need to acquire numerous new skills that are now needed to perform their duties (p. 9). Contemporary office workers will be better prepared to compete for and maintain positions in today's offices if they understand the various aspects of the dynamic role of information which are changing the competencies needed to survive in the modern office due to increasing automation and integration of office systems.

STATEMENT OF THE PROBLEM

The transformation to an information society entails not only a shift from paper to electronics but also a fundamental change in the nature and organization of office work, in uses of information and communications, and in the competencies of office workers (Giuliano, 1982, p. 149). To be competitive, efficient, and effective, information workers should understand the tools with which they will work, the nature of the work to be accomplished, the organizational structure in which the work will be carried out, and the competencies required to interact with both equipment and people.

By identifying and teaching the skills necessary to maintain an occupation, students will be better prepared to meet the evolving needs and demands of employers. Practitioners seem to agree that all office workers will need to acquire numerous new skills that are not now needed to perform their duties (Roessner, et al., 1985, p. 7). Through the identification of common information occupation competencies, workers will be better prepared to enter the automated office and educators will be better informed as to the content of their curriculum.

PURPOSE OF THE STUDY AND RESEARCH QUESTIONS

The primary purpose of this study was to identify the competencies that will be required of information systems workers in automated offices. Through the identification of competencies which reflect the changes taking place in the office, and through the incorporation of these competencies into educational curricula, students could benefit from the teaching of the skills to more adequately prepare them to compete for and maintain positions in an information/ technological society.

This study was conducted in an attempt to identify the competencies needed by information systems workers in an environment where integrated office systems are playing more and more of a key role. The questions to be answered in this study were:

1. What are the essential (necessary) competencies needed by information systems workers?
2. What are the less important competencies needed by information systems workers?
3. Do the identified information systems competencies fall into distinctive clusters which can be ranked in importance?

SIGNIFICANCE OF THE RESEARCH

Answers to the research questions in this study could have implications for the following areas of business education: (1) curriculum development or improvement, (2) teacher education, and (3) on-the-job training. Each of these implications is developed in the paragraphs which follow.

Curriculum development or improvement. To prepare students for work in the automated office, "program designs separating accounting from office, secretarial from clerical, and computer-related from noncomputer-related occupations" should be eliminated (Daggett and Branigan, 1987, p. 13). Curriculum must be designed to join courses in disciplines which typically have not been coupled. Lifelong learning and retraining will be continuous because jobs will be transitory. Students will need a multifaceted program to meet the demands of an information/technological age. Curricula need to be expanded to meet a diversity of needs and desires, while program expansion must continue to focus on the traditional basics while emphasizing new basics of higher level skills. As Daggett and Branigan (1987) explain:

> Creativity, critical thinking, synthesis, application, organization and reference skills, and evaluation and analysis skills are as significant as the "three R's" in the information/technological age (p. 13).

Teacher education. Identification of the competencies needed for information systems should have an impact on teacher education programs. Technical skills will continue to change. The need to overcome the fears of inadequacy in areas once mastered should be an item of high priority for business teachers. Awareness of changes in occupations, organizational structures, and the office as a location should force modification of teacher education programs to include research into pedagogical methods of instruction in order to incorporate these changes (Asselin, 1984, pp. 4-5).

On-the-job training. The results of this study also should have relevance for training on the job. There seems to be considerable time and expense expended in advancing the technology needed in the office, but very little in preparing employees to utilize technology effectively (Bikson and Eveland, 1986, p. 19). Consequently, many office workers do not have the skills and competencies required to cope effectively with the new technology or even to accept it as a potentially helpful tool (Asselin, 1984, p. 5). Training that will provide users with the needed competencies would not only enhance productivity, but might also help alleviate some of the fears concerning technological changes (Mankin et al., 1982, p. 36).

Identification of new competencies for job training needed by information systems workers should be an outcome of this study. These should form the foundation for designing on-the-job training programs to update and upgrade current information systems workers.

The present study also should be of assistance to other individuals within this professional field who are or who will be engaging in similar research by providing a basis of comparison.

DELIMITATIONS OF THE STUDY

1. The panel of Information Systems experts who participated in this study were self-selected from the entire national population of the Association of Information Systems Professionals (AISP). A sample of this type was vital to the present study so that the focus remained on competencies as perceived by information systems practitioners.

2. No attempt was made to make an in-depth study of specific equipment which is used by information systems

workers in the office environment. In the course of the study, references were made to certain pieces of equipment only for the purpose of investigating the knowledges and skills of information systems workers who use the equipment.

LIMITATIONS OF THE STUDY

1. The initial competencies for information systems workers originated from the current literature, other databases, and a DACUM committee. The final listing of competencies in the surveys were derived from these sources with additional input from the panel of experts.

2. This study was limited by the reliability and validity of the Delphi as a technique for collecting expert opinions regarding the competencies that were considered necessary for information systems workers. By using mailed surveys in each round of the Delphi, there was always the risk of losing participants. While personal interviews may have been a better method of validating the competencies, time and cost considerations eliminated this consideration.

ASSUMPTIONS

The assumptions that are pertinent to the present study are as follows:

1. There are skills which are necessary for competing and maintaining positions in an automated office.

2. Skills which are necessary for competing and maintaining positions in the automated office can be identified through the use of the DACUM committee approach and the Delphi technique.
3. The expert panelists selected to identify the occupational competencies are excellent sources of information regarding the skills needed in their professions.
4. The respondents would complete the questionnaire on the basis of entry-level skills for information systems workers.
5. All competencies identified in the survey instrument are of some importance for information systems workers because they were identified through the use of a DACUM panel.

DEFINITION OF TERMS: General

Automated office refers to the use of technological processes and interactions among people to handle information for business decision making.

Competency is defined as the knowledges, skills, and/or attitudes required of information systems workers to perform work-related tasks.

Developing A CurriculUM or DACUM is an approach to occupational analysis which utilizes expert workers to define the knowledges, skills, and attitudes that workers must have to successfully perform the tasks in a given occupational area.

DACUM committee is the group of experts who will be selected by the researcher to participate in the initial listing of competencies for information systems workers to be included in the Delphi survey instrument.

Delphi respondents are the individuals who will be self-selected to participate in the Delphi questionnaire used in this study from AISP. The terms respondents, experts, panelists, and panel members will be considered synonymous for the purpose of this study.

Delphi Technique is a research methodology which employs an intuitive approach to decision making on a given set of questions or issues dealing with the future. Generally, a Delphi study is carried on through iterative mailed questionnaires or surveys to recognized experts for the purpose of reaching consensus convergence on a given topic or issue. The neutral survey or questionnaire avoids the psychological factors of intimidation or the bandwagon effect in face-to-face meetings and enhances consensus.

Information systems is the integration of the human, organizational, and electronic systems in an organization which makes it possible to access, process, and disseminate information for decision making.

Information systems workers are workers in the office who will be affected by changes created by integration of information technology, job procedures, and working relationships in the automated office.

Integration refers to the method by which technology will combine office information systems (human, organizational, and electronic) for the purpose of making effective changes in job functions to ultimately process, communicate, and utilize information more efficiently.

Office automation refers to the application of electronic technology tools to office work. These tools may include large mainframe computers, minicomputers, personal computers or microcomputers, stand-alone word processors, professional workstations, and diverse telecommunications devices and systems which link these tools together.

DEFINITION OF TERMS: Survey Components

BUSINESS SKILLS include knowledge of the organizational, procedural, ethical, and analytical nature of the office.

COMMUNICATIONS SKILLS include the human and technical skills used in writing, speaking, listening, and nonverbal communication.

INTERPERSONAL SKILLS include behavioral job skills.

MANAGEMENT SKILLS include functions normally associated with planning, leading, controlling, and goal setting.

PROBLEM SOLVING SKILLS include recognition, definition, analysis of problems, and implementation of solutions.

INTRAPRENEURIAL SKILLS include the use of entrepreneurial skills used in the office.

TECHNOLOGICAL SKILLS include the ability to manipulate equipment, hands-on skills, and knowledges associated with equipment manipulation.

GENERAL EDUCATION SKILLS include English (grammar, spelling, and punctuation), speech, math, science, etc.

FORMAT OF THE STUDY

The purpose of this study was to answer the following research questions:

1. What are the essential (necessary) competencies needed by information systems workers?
2. What are the less important competencies needed by information systems workers?
3. Do the identified information systems competencies fall into distinctive clusters which can be ranked in importance?

To answer the research questions, this study is presented in the following format:

In Chapter 2 is presented a review the literature and issues specifically related to the evolution of new skills needed by information systems workers. Attention is given to the forces driving the integrated office system; the technological changes and the effects on people, jobs, and organizational structures; and the focus on the human concerns in the organization. The result of this review assesses the needs of the automated office as to specific skills which are essential in an information-intensive office. In addition, a justification for the methodology utilized in this study is presented.

In Chapter 3 is presented the methodology employed in this study to collect data to answer the research questions and confirm the assumptions.

In Chapter 4 is presented the findings of this study related to identified competencies for information systems workers.

In Chapter 5 is presented the summary, conclusions, and recommendations resulting from this study.

A list of references relating to information systems is included at the conclusion of the presentation of the study.

Appendices contain the survey instruments, letters of request and instructions to the Delphi panel, the reply form returned by the individuals in the study population which indicated interest in participating in the study, demographic data regarding the respondents, and supplemental information resulting from the study.

CHAPTER II

REVIEW OF RELATED LITERATURE

Information management is, has been, and will continue to be the business of the office. Electronic office technology has increased the amount and availability of, access to, and demand for information in an organization. Organizational structures are being changed to accommodate the flow of information; this then, in turn, is having an effect on the kinds of skills and knowledges required by people in the organization. Traditional views of the office must change to adapt to new ways of doing work.

The literature review in this study will relate to the skills, knowledges, and attitudes needed by information workers in order to compete for and maintain positions in the automated office. The result of this literature review is aimed at assessing the needs of the automated office as to specific skills which will be highly desirable in an information-intensive office with implications for curriculum development, on-the-job training, and teacher education.

The presentation of the review of related literature will be in two parts: (1) information systems skills for the automated office and (2) a discussion of the research methodology.

INFORMATION SYSTEMS SKILLS FOR THE AUTOMATED OFFICE

A framework for conceptualizing potential competencies for information systems workers can be drawn from recent studies which have focused on identifying skills for the world of work, "office of the future", word processing personnel, and the automated office (Asselin, 1984; Stoufer, 1982; Ettinger, 1982; Olney, 1980; Burford, 1979; and O'Neil, 1976). Rapid changes in the office environment and in office work created by the introduction and infusion of the microcomputer, as well as other new technologies related to telecommunications and networks, have elicited many attempts by researchers to keep others in the profession as current as possible. The overriding premise which is common to all of these studies is the element of change: change in work environment, traditional role relationships, traditional terminology and principles, and traditional procedures and practices. This present study also seeks to build upon the findings provided by previous research by identifying competencies for future information occupations workers.

The concept of "information systems" within the automated office focuses on the integration of three elements--organizational, human, and technological--in order to access, process, and manipulate information for efficient and effective decision making. Knowledges, attitudes, and skills must be identified with relation to the interrelated procedures, work flow, technology, and people in an ever-changing environment. Ruprecht and Wagoner (1984) state that "the office function can be performed in any location within an organization...[but that] the truly integrated electronic office is not a destination, but a journey... always under development" (pp. 8-9). Information workers will need to recognize that the skills which allow them to enter information occupations may require continuous upgrading in order to keep up with changes and advance within the occupation.

The review of literature in this section of Chapter II focuses on the organizational, human, and technological elements within the integrated office.

Organizational Elements

Information in the office traditionally flows between and among office components along formal and informal channels. Flows of information disseminate organizational goals and missions, forge the linkages between organizational units and assist the coordination and integration of the complicated interactions between specialized tasks (Hopwood, 1983, p. 37). To enhance the flow of information, organizational staffing patterns and procedures are developed to accommodate the various business functions or systems of accounting, finance, purchasing, sales, inventory, production, and various staff functions, as well as the social system, and to control the quality and quantity of information.

The traditional organization basically rests on command authority; i.e., the flow is from the top down. The military structure provided the example which many organizations have adopted as their own (Drucker, 1986, p. 206). Businesses have lived with the hierarchical structure and accommodated the people to it.

However, success of an information-based system may depend on asking new kinds of questions arising from the ability to access and "control" information at all levels of the organization:

> What should the company expect of me and hold me accountable for in terms of performance and contribution? Who in the organization has to know and understand what I am trying to do so that both they and I can do the work? On whom in the organization do I depend for what information, knowledge, specialized skill? And who in turn depends on me for what information, knowledge, specialized skill? Whom do I have to support and to whom, in turn, do I look for support? (Drucker, 1986, p. 206)

Access to information by all levels of employees is creating a flatter organization with fewer levels of management (Drucker, 1986, p. 204,; Pava, 1983, p. 126; and Tapscott, Henderson, and Greenberg, 1985, p. 169). Two possible forms of organization may evolve: a matrix form, whereby a person may report to a number of people depending on the ability to access and communicate information (Tapscott, Henderson, and Greenberg, 1985, p. 169); or a reticular organization where the distribution of information and authority is fluid and it shifts as required (Pava, 1983, pp. 126-127). In an information-based organization, the flow of authority is circular from the bottom up and then down again (Drucker, 1986, p. 206).

Drucker (1986) describes the flatter organization as making irrelevant the principle of "span of control" and replaces it with a new principle he calls "span of communications": the number of people reporting to one boss is limited only by the willingness of the workers to take responsibility for their own communications and relationships, upward, sideways, and downward (p. 204).

These forms of organization may not alter the appearance of the organization chart to the outside world; but it will have profound effects on the people, role relationships, and job skills inside the organization.

Evolving with the changes to the organizational structure must be strategies to enhance the success of the technical and social subsystems. These strategies will directly involve managers as well as secretarial and clerical workers to accomplish a particular job in the correct sequence (Bailey, Gerlach and Whinston, 1985, p. 5). Tapscott (1982) states that hardware (tools) and software (including media) must be integrated over time with what he terms orgware:

> ...Orgware consists of the procedures, workflow, job redesign, training strategies, implementation plan, educational activities, system responsibilities, and so on which

> optimize the social component of the new work system (p. 17).

In other words, any changes in the technical system must be implemented with careful consideration of the changes to the social system.

Lucas and Turner (1982) present their rationale for changes in organizational formation as patterns which may take the form of three alternatives to accommodate the technical systems, representing points on a continuum:

> At one extreme is complete centralization: all systems analysis and design are performed by a central group and all equipment is operated centrally...and data are located and controlled centrally. At the other extreme is complete decentralization: all equipment and staff reside at local sites...data are decentrally located and controlled. [The third alternative] distributed processing occurs when central and local sites are tied together in some type of communications network that permits resource sharing (p. 32).

According to Lucas and Turner, the benefits to the organization of each of these patterns is the development of a structure in which information flows in and out in a timely manner and reflects the organization's purposes and enhances productivity. According to Daggett and Branigan (1987):

> It will be necessary for all [office] positions to have a basic understanding of the relationship among the various subsystems within the totally integrated information processing system in order to understand the whole system (p. 7).

Being able to see the connection between the goals of the organization and the environment in which work is carried out to meet the goals will provide an insight into the role of the individual and technology in meeting the needs of the organization.

Acknowledgement of the changes in office structure must be concomitant with the recognition that new skills will be expected. Drucker (1986), Tapscott, Henderson, and Greenberg (1985), Pava (1983), and Tapscott (1982) have recognized that a flatter organization requires workers to be self disciplined, be able to ask questions, be able to set goals and objectives, be flexible, make fast decisions and quick responses, and accept responsibility.

Telecommuting. One organizational pattern which has not been discussed and bears mentioning is telecommuting: working at geographically-independent locations, such as home, offshore, or in centrally located work centers. Kleinschrod (1987) passes on what John Diebold has written about telecommuting:

> ...this could lead to widespread decentralization of many office functions. People previously unable to travel--the handicapped, or parents with small children--represent an enormous untapped human resource that might easily "telecommute" to become part of an office workforce. For others, the home office will be a matter of deliberate choice...(p. 129).

Kleinschrod points out that workers seem to know about telecommuting and consider it feasible for a while but they say "you better soon get back into the communicational swing of things at the office or quickly lose touch with what is going on." He suggests that one compromise between home and the office is the satellite work center which he describes as "an intelligent facility perhaps shared with other companies" (pp. 129-130).

Jarrett (1984) says that the economics of scale currently apply to offices. The contemporary idea of business administration necessarily involves putting groups of people together in the same place, because that is the only way the information will flow from one function to another. He goes on to say, however, technological capabilities will change the office of tomorrow:

> ...you don't need to devote space and resources to ranks of filing cabinets; you don't need armies of filing clerks; you don't need job structures;...a company will be able to distribute its offices away from high rents...the staff will be able to avoid the discomfort of commuting... people will choose "telecommuting" to work from home with their workstation terminal...and the company might link together several small offices...(pp. 38-39).

The Office of Technology Assessment (1985) cautions that there are legal questions to be resolved regarding "farming" out office work to homes, as well as wage and salary questions (p. 21). The whole aspect of telecommuting, however, sheds a different light on organizational staffing and procedural patterns.

Human Elements

If the organizational structure is being altered by the proliferation of automated office systems, what are the skills needed by information systems workers in order to compete for and maintain positions in the organization?

General Education. General education may be defined as courses which provide the common core of curriculum required of all students, regardless of the major field of study. Courses which fall into this broad category might include those which focus on developing what have been termed "life" skills: adaptability, coping, values, and attitudes, as well as a general academic core of coursework.

A report published by the Office of Technology Assessment (1985) stated that basic skill requirements for any office worker should include reading, writing, spelling, and some math proficiency (U. S. Congress, Office of Technology Assessment, 1985, p. 78). Daggett and Branigan (1987) report on a statement made by U. S. Secretary of Education, William J. Bennett, which supported and expanded this statement:

> In order to meet the changing needs of our society and our students, education must "stake out a sensible middleground" between academics and trade skills. He went on to urge the education community to adopt a "solid academic curriculum" that places greater emphasis on "broad career education" than on "job-specific training." He further stated that emphasis should be placed on the teaching of "general skills, general knowledge, and worthy values and habits" (p. 7).

A policy statement issued by the Committee for Economic Development entitled, Investing in Our children:

Business and the Public Schools, stressed the value of a common curriculum emphasizing critical and analytical thinking skills [such as acquired through math and science], self-discipline, lifelong learning, responsibility, communication skills, flexibility, and the work ethic (Daggett and Branigan, 1987. p. 7).

To be prepared to succeed in the information-intensive office, learning to think must take high priority. The importance of thinking skills for the future is tied to survival in the information economy, according to John Seel (1985), an educational associate of the Naisbitt Group in Washington, D. C.:

> Critical thinking is central to economic survival in the information economy. The average worker in the future will need to be retrained up to eight times. Learning how to learn is necessary for adaptability. Education will not be a 12- to 16-year process. The worker of the future needs an educational life-style.
>
> Critical thinking is also central to long-term political stability. Walter Lippmann and others have long argued that free access to information is basic to a democratic society. Lippmann wrote in 1920, "There can be no liberty for a community which lacks the information by which to detect lies." Today we are drowning in information. Lippmann's concern needs to be amended. There can be no liberty for a community which lacks the critical skills to tell the difference between lies and truth (p. 5).

The same message was brought to the attention of a group of educators by George Mason (1986), business owner in Hawaii, who said:

> Employers do not consider specific job skills to be as important as good academic skills and positive attitudes toward work [speaker's emphasis]. Business wants people who can read, write, verbalize in English, and who can adapt to the changing world of work. In effect, business wants people who have learned to learn [again, speaker's emphasis] (p. 10).

Adjusting to an environment where everything is changing at such a rapid pace may require workers to acquire a variety of knowledges, traits, and competencies. Only focusing on technological competence at the expense of the broader personal survival skills may do students an injustice. A strong argument has been made for the importance of general education skills.

Business Skills. Employees at all levels of the organization must be familiar with the mission of the organization and its products and services. The mission, goals, and values of an organization, the nature of the business, and the nature of the work and the context in which it is performed provide the conceptual framework into which information systems will converge in an organization (Bikson and Eveland, 1986, p. 9). The rate with which technology is changing requires that a successful organizational framework be open, adaptable, and amenable to change.

People in organizations respond differently to technology in general. However, organizations need to have mechanisms in place to reward those individuals who interact with their systems creatively, who make good decisions, and who remain flexible in accepting change (Bikson and Eveland, 1986, p. 19; Baetz, 1985, p. 86). Dealing with change [more precisely, the rate of change] and its effects on work and people will be one of the most important skills information systems workers can acquire (Blaazer, 1984, pp. 139-140).

Today's organization is no longer a classic, multi-level pyramid. It is becoming less hierarchical, flatter, richer, faster, more precise, more innovative, more information dependent, more responsible, and interconnected. This trend becomes more complex as middle levels of management are compressed and squeezed and the demand for clerical workers with technological skills rises. Key decisions are increasingly being made by those who can most efficiently input, store, retrieve, and disseminate information (Bernstein, 1987, p. 22; Raymond, 1986, n.p.).

"Data ownership" is a common source of political strife within the organization, according to Karten (1986). This issue strikes at the heart of ethics, values, and standards within the corporation. She states

> Does corporate data "belong" to the organization as a whole? Or, to the user area that updates the data base? Should there be a single data base administrator to play traffic cop for all corporate data? Which elements are really sensitive and which are sensitive only in the eyes of the self proclaimed "owner"? All users want access. But often what data

44

> sharing means to users is that they want access to someone else's [Karten's emphasis] data, not that they want someone else to access theirs [Karten's emphasis] (p. 8).

Alvin Toffler (1980) states that one of the trends in the Third Wave of technological advances in the Western world is the rise of intrapreneurs--employees who are characterized by the potential for creativity and innovation and are willing to develop skills to work autonomously as entrepreneurs within the organizational structure.

Gifford Pinchot, III, who developed the idea of "intrapreneuring", states that intrapreneurs are "self-starters who are motivated to see their product or service come into being" (McKendrick, 1983, p. 24), but who are not necessarily interested in working outside of the organization. Indeed, Baetz (1984) emphasizes that when technology allows workers to do new things in new ways, "the management style [should be] characterized by encouragement of innovation... participative decision making...and by collaboration among those within the organization" (p. 86).

Raymond (1986) goes on to elaborate on Toffler's premise that the politics of the Third Wave organization will be based on new collaborative networks. Knowing how to utilize networks--human and electronic--will enhance the individual's decision-making worth to the organization.

Drucker (1986) states that the information-based system allows for far greater diversity, making it possible "to have within the same corporate structure managerial (Drucker's emphasis) units and entrepreneurial (Drucker's emphasis) units charged with making obsolete what exists and with creating a different tomorrow" (p. 205-206).

Management Skills. The ability to plan, organize, control, and direct people or functions has been recognized as the purview of management. If, as Drucker (1986) has stated, the information-based organization is characterized by a "span of communications", the ability to access and obtain information will make all employees responsible for setting objectives, controlling, and managing their tasks in harmony with others. Several studies related to office automation skills have supported the value of management skills for office employees (Asselin, 1984; Stouffer, 1983; Ettinger, 1982; Dennee, 1981; Olney, 1980; Burford, 1979). Problem solving and decision making, as well as organizing and scheduling skills, are among the most important skills needed by office employees according to the findings of Burford, Ettinger and Asselin. With technological equipment taking over much of the repetitive work in the office, "tasks are no longer routine but involve decision making and problems skills that are used in the design and coordination of a system of people, procedures and equipment" (Ettinger, 1982, p. 5).

Asselin (1984) found in his Delphi study that essential skills for office workers should include setting priorities and managing time effectively; developing and improving some work methods; and solving problems and making decisions (pp. 53-54). For Burford (1979), decision making, problem solving, organizing and scheduling skills were among the most important competencies office employees could have. These skills become even more critical as the scope of office work and location of the office itself changes.

Interpersonal Skills. Human relations involve the mechanisms inside and outside the organization (structural, interactive, managerial, and procedural) which provide for social contact between persons. This interaction of all levels of employees in the integrated office will require more critical attention as technology continues to pervade the office and threatens traditional working relationships.

"People skills" will still remain vital to employees' success in the changing office. According to Harvey (1987), these human relations skills include goal setting, personal appearance, good self concept, communications, listening, ability to cope with criticism, decision making, teamwork, and handling conflict. Her rationale is that

> With increased opportunities to participate in management have come greater expectations of employees. Today's business employee must solve problems in the workplace, develop new competencies, and produce in a more competitive atmosphere...[Human relations] are so critical that more workers lose their jobs because of their inability to get along with

> fellow workers than for any other reason...Employers have stated that some of the things they look for are cooperative attitudes, enthusiasm, practical expectations, and punctuality...(pp. 29, 37).

In Asselin's (1984) study, twenty-four attitudes and personal traits formed the single largest block of high priority/high consensus competencies. Responses of experts in his study found that

> ...automated office workers should use discretion in confidential matters; demonstrate interest in their work; accept responsibility; exhibit flexibility, versatility, and leadership; demonstrate initiative, imagination, autonomy, and creativity; accept constructive criticism; follow oral and written instructions; be willing to work under pressure; exhibit honesty and loyalty; work effectively with people;...show care in matters of dress; adapt to change; accept challenges presented by new office equipment and procedures; continue to learn and develop professionally;... and show good judgment (p. 66).

While it is meaningful to know what skills are important from supervisors' points of view, it is equally as enlightening to know what office workers expect from their work. Baetz (1985) states that while the workplace is undergoing change so is the workforce. "Employees of the 1980s and 1990s are qualitatively different from employees of the past...with the differences being in education and skill levels, age distribution...and values espoused" (p. 21). Workers who are more educated feel more powerful; they are interested in growth and development on the job. If growth and development is not available in one position, they feel strong enough to move to other positions or fields. She goes on further to state that the desire of these employees for "new ways of working are creative, flexible, innovative and proactive--just the employee traits organizations need to cultivate to be responsive to their environment" (p. 23).

The office is composed of people who work together toward common goals and objectives, usually in groups. It is imperative that the skills for working with people and the expectations of workers are satisfied in order to successfully achieve these goals and objectives.

A study conducted by Luft and Schoen (1986) found that employee success in the work world depends upon nontechnical business competencies as well as technical competencies. They surveyed business educators in Illinois and employers of their graduates to determine whether nontechnical competencies were being addressed in business education curricula. The nontechnical competencies studied fell into five categories: problem solving, stress management, professional characteristics (identified as initiative, cooperation, reliability, honesty, loyalty, confidentiality, punctuality, good work habits, adherence to company policy, demonstration of courteous and helpful behavior), communication skills, and human relations principles. Their findings concluded that the professional characteristics received more emphasis in the classroom than any other area; employers also felt these were the most important competencies for new employees. However, it was also concluded that not enough emphasis is being given to these competencies. Their recommendations were that stronger emphasis should be placed on teaching nontechnical employment competencies and for a longer duration.

Communications Skills. Even with the use of sophisticated communications software in the automated office, the ability to relate and communicate effectively with all levels of employees is not likely to diminish. The requisite communication skills are broad-based and include the gamut of verbal, nonverbal, and written skills.

Communication is still considered the number one priority competency for office employees, according to a recent article by O'Neil and Prarat (1982). The importance of this skill is illustrated in the following comments by Joner (1986):

> [The automated office] also will suffer from the belief that individuals can do their own work from beginning to end without intervention or assistance from another professional--the grammarian...Those who are concerned about high quality results have hired [workers] with demonstrated excellence in writing, spelling and grammar (p. 114).

Preparing prospective employees for the automated office requires attention to the communication skills of reading; basic English; writing letters, memos, and reports; proofreading; and oral presentations according to an article by Burnett and Dollar (1986). Even though computer programs are available to check spelling, grammar, and punctuation, there is no substitute for an efficient, effective proofreader.

Other studies (Ettinger, 1982; Olney, 1980; Burford, 1979;) support the need for grammatical, proofreading, listening, and dictation skills, as well as control of body language.

Personal traits and good communication skills are the very skills that can never be replaced by computers, software, and other technological developments. Computers can never develop interpersonal relations and gain understanding through nonverbal cues (Stoufer, 1982, p. 73). A solid combination of technological skills and human relations skills will become more essential in the automated office.

Human concerns. The recent history of integrated office systems has shown that the rush to increase efficiency and productivity has resulted in the lack of appreciation for the "people issues" related to acceptance of new technology. Tapscott (1982) defines these as "technology-driven" concerns. When people in the organization have arrived to find microcomputers at their desks, the natural inclination has been to resist (Zuboff, 1982, p. 142). Meyer (1983) calls for a very well thought out office automation strategy which takes into account the benefits to the people, as well as to the work and the organization (p. 51).

The human side is the most important aspect in any consideration of jobs and organizations (Taylor, 1975, p. 17) and must be considered simultaneously to the technical and production requirements of the work. When information technology reorganizes work and procedures, new patterns of communication and interaction are possible. In a dynamic work environment, the social network is an important buffer between the worker and other elements in the work place, especially the computer terminal. In this environment, there is a tendency for the worker to spend greater portions of the day interacting with a computer. Researchers have recognized this potential:

> There will be more need for lounges and discussion rooms and the like, to break the routine of stress from the machines. As tasks become more mechanical and isolating, more group activities and worker clubs and incentive systems need to be developed to keep up team spirit and morale (Office of Technology Assessment, 1985, p. 135).

Decades of research have established the importance of social communities in the work place and the lengths to which people will go to establish and maintain them (Zuboff, 1982, p. 147). The human resource in an organization is the pivotal ingredient on which the success of the automated office hinges.

Naisbitt (1980) has called this concept "high tech/high touch"; that is, whenever new technology is introduced into the environment there is a counterbalancing human response of high touch. Without the high touch, the concept is rejected. And the more high tech, the more high touch.

Technological Elements

The evolution to integrated office systems not only will be economically feasible but highly desirable to all levels of workers as electronic storage and retrieval processes combine to encompass office technology in the form of electronic mail and voice messaging systems; local and wide area networks utilizing telephone, microwave, or satellite transmission media; desktop computer configurations referred to as workstations, as well as mainframes and minicomputers; sophisticated word and information processing software; advanced reprographic systems, including intelligent copiers and printers; optics; and desktop management software. New positions, as well as new skill requirements for new and old positions, will evolve, also.

The magnitude of the changes fomented by the proliferation of electronic equipment is illustrated in a report from the International Data Corporation (Predicasts Datebook, 1983) which states that sales to business and industry of computers and auxiliary equipment rose from $3.1 billion in 1967 to $36.5 billion in 1983, representing an average annual rate of nearly 17 percent (p. 94). The IDC report (1983) goes on to state

> that by the end of 1983 there were about 18.5 million electronic keyboard devices (PC's, other computers, terminals, and word processors) in use, or about one for every three of the 55 million white collar workers. By 1987, they forecast 54 million electronic keyboard devices, or virtually one for every white collar worker (p. 94)...They further forecast an installed base of about 19 million PC's in the U.S. business/professional market by 1987, or about two PC's for every three managers and professional workers (p. 2).

Roessner (1985) forecasts that at this rate of market penetration, by 1990 virtually all white-collar workers in the United States will be working with electronic keyboards; and most, if not all, nonclerical white-collar employees will be working regularly with a PC or electronic workstation. By 1995, every manager, professional/ technical worker, and office salesperson will be working with an electronic workstation (p. 14). "The creative use of computers by nondata processing experts, namely 'end users,' is one of the most significant developments in corporate computing to have taken place in the past decade" (Henderson and Treacy, 1986, p. 3).

Keyboards, which were initially used exclusively by secretaries, may now be a requisite skill for all levels of employees. The modification of keyboards to include other input devices, such as the mouse, light pen, and the touch sensitive screen, have been developed by vendors for those who are reluctant to use the traditional keyset. However, it has been noted that there is a general trend for individuals at all levels of the organization to acquire some keyboarding skills (Tapscott, 1982, p. 8).

A study by Graves (1985) asked office systems consultants, office administration faculty, and other collegiate business faculty to rate the importance of 42 concepts needed by managerial personnel in automated offices. The concepts were arranged in five categories: origination, production, reproduction, filing and records storage, communication and distribution, and integrated office systems. Each concept statement was preceded by the term "the use of". Thirty of the forty-two concepts were rated as required or essential with the greatest number found in the areas of integrated office systems, communications and distribution, and filing and records management. The essential or required competencies cover a wide range of technological skills, including the use of:

> ...dictating machines...visual display text editors...electronic keyboard typewriters... computer graphics...magnetic media storage... computer-assisted retrieval...electronic mail systems...facsimile...teleconferencing... executive workstations...distributed logic...decision support systems...and administrative secretarial support workstations... (pp. 93-99).

Equipment-related skills which Asselin (1984) found to be important in his study of competencies needed by automated office workers included operating word and data processing equipment and electromagnetic storage devices, selecting appropriate tools, and detecting and reporting equipment malfunctions to be critical skills (p. 66).

Burford found in her study in 1979 that the use of equipment associated with microforms, word processing, and telecommunications were important. Olney (1980) reported that an important characteristic for entry-level office workers is the capability to interface with all kinds of computerized technology.

Advances in electronic communication technology are changing many of the traditional ways communicating in the office. Fisher (1987) pointed out that students should be made aware of changes occurring in electronic mail; electronic publishing; telecommunications; interactive television; electronic encyclopedias, thesauruses, outliners, spelling checkers, and English syntax style analyzers; networking; speech recognition systems, cordless, high-tech, and cellular telephones; high speed facsimile; teleconferencing; and microwave linked offices (p. 55). Hands-on experience in all of these areas is not necessary, she says, but heightened awareness and conceptual knowledge is.

Friedheim (1987) pointed out that business education programs must include emphasis on all aspects the person-machine interface (p. 68). How well users embrace new technologies and procedures will determine how well the transition is made from school to work. Specific activities in which she says that students could engage include:

> ...practice in planning and designing an office, demonstrate electronic calendar software, compare and evaluate hardware and software, locate and compare vendors for particular hardware and software, visit an electronic print shop, practice in composing on electronic equipment (and at the same time making decisions on formatting and revisions), collect business information from which to prepare and write a report with accompanying graphics, research records and storage systems, and study concepts, terminology, and systems used in telecommunications (pp. 68-70).

Office technology is developing at a rapid rate, forcing office workers to keep pace or face the danger of becoming outdated. The nature of the automated office itself is undergoing change which holds the potential for better information management, communications, and decision making along with increased job satisfaction, quality of work life, and opportunities for growth (Tapscott, 1982,p. 25). Burns (1978), however, recognizes that

> there is an associated risk with tampering with the most sophisticated process I know of--the office. Although we take it for granted, it is the product of 200 years of development and refinement, and changing it will require our best systems planning skills (pp. 21.34).

Summary

In preparing to be a part of the automated office which relies on the integration of automated information systems and human needs and concerns, society must be willing to accept and adapt to the new skills for new methods, as well as new skills for old methods. Many of these skills include the knowledge of procedures and information flow in an organization; business skills of adapting to and managing change; problem solving and decision making; flexibility; management skills of planning, controlling, and organizing; interpersonal and communications skills; and the ability to interface with and adapt to all kinds of automated information technology. In addition, a solid foundation in basic skills requirements of reading, writing, analytical and abstract thinking, and math proficiency will be even more critical in the automated office.

The danger lies in focusing only on the technical side and not recognizing that dealing with many complex human and organizational issues in systems integration and implementation are appropriately critical. Carlisle (1977) states that "too many computer-based systems have been designed on the basis of technological breakthroughs and innovations which were insensitive to the limit of man's rationality and the social needs which must be met within organizational structures" (n.p.).

Bringing people into the office who are prepared to adapt to change and to cope with the ambiguities of organizational restructure and technological change will be a constant challenge for managers and educators for some time to come. The emphasis on the integration of information technology, organizational issues, and human concerns focuses the need for studies of this kind which will identify competencies for information workers in the automated office in order to maintain occupational viability.

DISCUSSION OF METHODOLOGY

In order to answer the research questions in this study, the DACUM committee and the Delphi Technique approaches were used to identify and validate the competencies for information systems workers. A literature review of these two methodologies is presented below.

The DACUM Committee

The DACUM approach. Developing A CurriculUM or DACUM is an approach to occupational analysis that involves bringing a committee of occupational experts together under the leadership of a trained facilitator. It has proven to be a very effective method for quickly determining, at relatively low cost, the tasks that must be performed by persons employed in a given job or occupational area.

DACUM was initially created as a joint effort of the Experimental Projects Branch, Canada Department of Manpower and Immigration, and General Learning Corporation of New York, which provided technical direction to the Women's Job Corps program at Clinton, Iowa (Finch and Crunkilton, 1984, pp. 145-146; Adams, 1975, p. 23). According to Adams (1975), "early efforts at Clinton were intended to produce a curriculum guide that would enhance trainee involvement in the training program and in planning for goal attainment" (p. 23). Other early participants in the development and utilization of the DACUM approach were the Nova Scotia NewStart Corporations, which used the approach to respond quickly to providing training for disadvantaged adults; and Holland College in Charlottetown, P.E.I., Canada, which applied the approach to develop all of its educational programs (Adams, 1975, p. 23).

The DACUM approach has been employed successfully by a number of educational institutions: Caldwell Community College and Technical Institute in Hudson, North Carolina, utilized the DACUM approach to analyze the job of radiologic technologist (Open Doors, 1979, pp. 16-17); Trident Technical College in Charleston, South Carolina, conducted an analysis of the job of the industrial mechanic (Norton, 1985, p. 76); and the Colorado Instructional Materials Service at Colorado State University, Fort Collins, conducted an analysis of the job of legal assistant.

DACUM involves using a committee of ten to twelve resource persons who are experts in a particular occupation. It operates on three premises: (1) expert workers are able to describe and define their jobs better than anyone else; (2) any job can effectively and sufficiently be described in terms of tasks that successful workers in that occupation perform; and (3) all tasks have direct implications of the knowledge, skills, and attitudes that workers must have in order to perform the tasks correctly (Norton, 1985, p. 1). A unique aspect of the DACUM approach is its use of a single sheet profile which displays the present skills of an entire occupation to reduce the chance of treating one element of an occupation separately from the others (Finch and Crunkilton, 1984, p. 146).

The committee members in the DACUM process are selected because they represent incumbent workers, supervisors of workers, or are knowledgeable about the specific field. They are charged with deciding what skills ought to be taught to students in their field by defining the occupation, identifying the general areas of responsibility, outlining, and sequencing the specific tasks performed on the job, and reviewing and refining the final occupational profiles.

According to Adams (1975), the key role in the DACUM process is played by the facilitator to provide an atmosphere which is conducive to group interaction. Interpersonal communication skills, such as listening, verbalizing, providing feedback, and questioning are critical skills, as well as demonstration of brainstorming and consensus-seeking behaviors (pp. 58-59). The goal of the facilitator in this process is to elicit the most specific information possible about the occupation being analyzed.

The DACUM process is especially suited for researching competencies in the development of new educational programs and, for this reason, was chosen for this study.

The Delphi Technique

Utilized for this study because it has proven to be successful when applied to forecasting and planning purposes was the Delphi technique. The Delphi technique was developed in the late 1940's and early 1950's by Olaf Helmer and his colleagues at the Rand Corporation to obtain group opinions about future dates of occurrence of social and technological advances (Helmer, 1964, pp. 1-14). The Delphi methodology employs an intuitive approach to decision making on a given set of questions or issues which deal with the future. This method of forecasting has been applied to long-range technological developments, evaluation of programs, business forecasting, educational innovations, and decision making (Dole, et al., 1969, p. 52). Delphi methodology utilizes surveys that seek to induce opinion convergence among a group of experts responding through a sequence of iterative feedback processes that produce consensus while allowing for dissent (Cicarelli, 1984, p. 141-142).

Delphi panelists are asked in a series of surveys, usually referred to as "rounds", to give their opinions anonymously on the relative importance of the survey issues. Usually the "rounds" of surveys are carried on by mail and not in face-to-face meetings. The superiority of this technique rests with the fact that panelists can be objective and will not feel intimidated in expressing their opinions about the individual items on the survey. Their opinions are their own and are not influenced by stronger or more influential committee members as might occur in face-to-face meetings.

Olaf Helmer (1966) states that this technique may be used successfully in the field of educational planning (p. 6) where informed judgment, anonymity, and common goals serve to enhance consensus. It is desirable in many Delphi studies to benefit from subjective judgments on a collective basis rather than through analytical techniques.

According to the literature related to the Delphi technique, several factors may affect the reliability and validity of the Delphi due to the lack of administrative standards to guide its application. These factors may include: (1) quality of the Delphi instrument, (2) selection of Delphi respondents; (3) commitment of respondents; (4) size of the Delphi panel; and (5) the number of rounds to reach consensus. These factors provide the basis for the methodology which was applied in this study and are discussed below.

Quality of the Delphi Instrument. A principle of survey methodology is that the research instrument and its component statements or questions should be designed carefully so as to avoid ambiguous stimuli to the respondents (Hill and Fowles, 1975, p. 181). Several factors may affect the quality of the instrument utilized in a Delphi study, as follows:

1. Length of the questionnaire: Obviously, the length of a questionnaire contributes to the long-term interest and participation of the panelists. Brockhaus and Mickelsen (1977) undertook an exhaustive literature search upon which their questionnaire was based, and admitted in their study that "a significant amount of time and effort was required to complete the questionnaires", but that the response level was good and the responses were well thought out and provided a great deal of new and useful information (p. 105). Their questionnaires were composed of three parts--respondents' background, open-ended issue questions, and 49 to 65 scaled response questions focusing on various aspects of the Delphi method.

2. Development of questions: Critical to the development of questions for survey purposes is attention to clarity, brevity, and specificity. Generally, during the first round of questionnaires in a Delphi study, respondents are asked to contribute issue statements or to respond to broad questions pertaining to the survey subject (Cicarelli, 1984, p. 142; Kruus, 1983, p. 269). However,

Adams (1980) utilized a panel of lawyers to develop an initial set of issues to be investigated in her study (p. 152). From this initial set of issues, the formal survey instrument was developed and used in Round One of her study.

3. Scales used: There is a noticeable lack of discussion in the literature on the different methods of scaling which could be used in a Delphi. Initially, Delphi surveys were characterized by the use of open-ended questions on the first-round questionnaires (Weatherman and Swenson, 1974). Simple rank ordering of statements having to do with areas under study also has been utilized (Cicarelli, 1984). A Likert-type rating scale also is commonly utilized in contemporary survey questionnaires in Delphi studies (Asselin, 1984). The value of this type of scaling is that it lends itself to showing relative strength and intensity of the response of the participant (Babbie, 1973, p. 269). A prime reason for using a Delphi is not only to determine the importance of each of the event statements, but the degree to which one is preferred over another. Scheibe et al. (1975) found that the rating-scale method was considered by the participants as the most comfortable to complete and they concluded that "it may not be unreasonable to accept cautiously the results of simple rating methods as fair approximations to an interval scale" (pp. 272-273).

Selection of the Delphi Respondents. A Delphi study is its panel whose members are recognized experts in their fields (Cicarelli, 1984, p. 140). Because of the significance of the panel, care should be taken in the selection of participants. Respondents are chosen generally because they command a specialized body of knowledge and experience with the subject of the study (Hill and Fowles, 1975, p. 187). Adams (1980) suggested that participants in a Delphi study "should be recognized authorities in the field being researched" (p. 157). For Brooks (1979) the key to this issue is simply that "panel members be knowledgeable in the subject in question, represent as many different points of view as feasible, and be willing to share in a meaningful way their personal perceptions" (p. 379). Generally, respondents in Delphi studies represent diverse backgrounds with respect to experience and expertise. This heterogeneity is needed to preserve the validity of results.

Commitment of Respondents. Involvement of respondents is a key element in the success of a Delphi study. Because respondents are selected as knowledge-specific experts, it is generally assumed that they will participate in the study for as long as it takes. In order to encourage and support that premise, every effort should be made to "provide potential participants with fairly complete information of the overall design of the study when soliciting their involvement..." (Weatherman & Swenson, 1974, p. 105). To obtain a high level of participation, the prospective participants must be made to feel that their responses are important and valid (Cyphert and Gant, 1971, pp. 272-273).

Size of the Delphi Panel. A review of various Delphi studies reveals that there is a wide variation in the numbers of participants from which to gather information. With respect to forecasting, it has been hypothesized that the accuracy of Delphi results will increase with group size. When Brockhoff (1975) tested this hypothesis separately for face-to-face discussion groups and Delphi groups, he found that a "general positive relation between group size and group performance cannot be recognized" (Brockhoff, 1975, p. 320). Cicarelli (1984) sent out more than 600 letters to economists, asking for their participation in his Delphi study. His rationale was "that a large panel is more cumbersome to work with...but this cost has its compensating benefit in the form of a broader spectrum of viewpoints and opinions" (p. 141).

Brockhaus and Mickelsen (1977) conducted a Delphi study into the application, usefulness, and future applicability of the Delphi technique itself (p. 105). A population of 1500 individuals on a worldwide basis who had been involved with the Delphi technique was sampled. Of these 1500 individuals, 800 offered to participate.

Brockhaus and Mickelsen found that it was possible to "conduct a large number of comparative analyses...because of the excellent response" (p. 105). Moreover, in many studies, more individuals are needed than can effectively interact in a face-to-face exchange.

Number of Rounds Needed to Reach Consensus. There is a wide variation in the Delphi literature regarding the number of rounds required to reach consensus convergence. The Delphi technique is essentially a set of questionnaires, usually taking two to five rounds of questioning. In essence, the rounds serve to referee the opinion process. Three rounds seem to be typical in the published literature, with the first round soliciting a response to an open-ended question or to a statement; the second round asking for the same information and also providing feedback in some statistical summary format to the responses from the first round; and the third round providing information from the second round and so forth. The iteration process is intended to emulate the discussion that takes place in a conventional committee meeting setting, assuming that pressure is put on those who remain outside of the consensus to shift toward consensus of the group.

Dietz (1987) tested the hypothesis in his study that the accuracy of Delphi forecasts would improve from round to round as a result of feedback and iteration. In his study, three iterations of a survey were given to his panel of experts to forecast the outcome of a forthcoming state election. His findings indicated that iteration did not improve the precision of Delphi forecasts and that "researchers may be able to save time, money and avoid panel fatigue by using a simple one-round survey rather than a traditional multi-round Delphi" (pp. 81-84).

Cicarelli (1984) used three iterations of his questionnaire to determine the shape of economics in the year 2001. The second and third rounds of the questionnaire provided feedback to the respondents as to the group's comments and summary results (p. 144). Adams (1980) utilized three rounds of a survey instrument in her study of new and future arbitration issues. However, only two rounds of a questionnaire were used in Kruus' (1983) study of university planning and development due to a limitation of time. Round two of his study provided the same statistical summary and feedback as other studies using three rounds. A growing body of research implies that two rounds of a questionnaire in a Delphi is adequate.

Brockhaus and Mickelsen (1977) utilized two rounds of a questionnaire in their study of the issues associated with Delphi applications to find that their panel of experts felt that the Delphi technique should be "preceded, followed, and paralleled" with other formal methods of research (p. 108). Nelms and Porter (1985) incorporated the Delphi and nominal group techniques to create a new expert opinion technique called EFTE (estimate, feedback, talk, estimate) to forecast the impact of information technologies on clerical work.

In a study of the use of the Delphi research methodology for the years of 1970-1984, Rieger (1986) reveals that a number of researchers are using the Delphi in conjunction with other modifications, such as the critical incident technique, face-to-face discussions in the final round, and scenario construction (pp. 200-201).

Care must be taken in requiring a consensus to stop the iteration process in a Delphi study. In most Delphi studies, consensus is assumed to have been achieved when a certain percentage of responses falls within a prescribed range, after each respondent is asked to reconsider his/her previous answer. Consensus of the panelists as to the importance of each statement on a questionnaire is determined by the median and the interquartile range. The median is the fiftieth percentile of responses ranked in numerical order. The interquartile range (IQR = Q3 - Q1) is the difference between quartile one and quartile three, or the spread of 50% of the responses about the median. The perceived importance of the statement increases as the median increases. The consensus on the importance of the statement increases as the interquartile range decreases.

Using the median to determine degree of importance has been justified by Binning, Cochran and Donatelli (1972). Their study indicates that

> It is a fact that if the true answer to the question lies outside the answers given by the group, then the median is as close to the true answer as one-half of the group; also, if the range of answers given by the group includes the true answer, then the median is closer to the true answer than half of the group. If the distribution of answers given by the group is normally distributed, the same would hold true of the mean; however, in many cases, the distribution of answers is skewed, making it advisable to use the median. This illustration supports the rationale for using the median. When the median is used as a measure of central tendency, the interquartile range is used as a measure of variability. Thus the median and interquartile range is normally used in classical Delphi analysis.

Summary. The purpose of this study was to identify the essential competencies for information systems workers in the automated office. The DACUM committee approach utilizes experts in the occupational field to develop lists of competencies and tasks; the Delphi technique utilizes experts in the occupational field to identify and validate future competencies needed by workers in the particular occupational field. Both of these techniques seemed appropriate to use in the present study.

CHAPTER III

METHODOLOGY

The rapid technological changes which are occurring in the workplace are forcing innovative ways of viewing the office, its organizational structure, work, and people. To better understand the effects of technology on the office environment, the present study was undertaken to focus on the identification and validation of competencies for information systems workers who will be dealing with the changes and competing for positions in the automated office. Data which can be used for curriculum development and improvement should be an important outcome of this study.

The exploratory nature of the present study deemed it appropriate to use the descriptive research design. Descriptive studies can be helpful and meaningful in diagnosing a specific situation or in proposing a new and better program. Borg and Gall (1983) suggest that descriptive investigations may provide the basis for identifying needed emphases and changes in curricula, programs, or applications.

The independent variables of the present study were the statements relating to information systems components and competencies. Responses from the panelists who were information systems workers were viewed as dependent variables.

INSTRUMENTATION

Preliminary Data Collection

The selection of competency statements related to information systems began by conducting an extensive analysis (meta-analysis) of off-line and on-line library literature. This review included a search of materials such as dissertations, theses, books, government documents, periodicals, Educational Research and Information Center (ERIC) documents, and other media. Other on-line databases, such as the ABI/Inform business index, the on-line Dissertation Abstracts Index, and the on-line Psychological Abstracts index, were accessed via library computer searches.

In addition, letters were sent to state directors or program directors for office and business education, asking for access to curricula or studies pertaining to the automated office. Names of individuals with an interest or experience in various aspects of the automated office also were solicited. Feedback from this inquiry resulted in information from individuals representing 25 states.

Model curricula were reviewed for content and format from the following organizations: Data Processing Management Association, Professional Secretaries International (PSI), National Business Education Association, Office Systems Research Association, and Office Automation Society International. Literature also was reviewed from certifying agencies, such as the Institute for Certification of Computer Professionals (ICCP) regarding the Certified Systems Professional examination, and PSI regarding the Certified Professional Secretary examination.

Discussions with office personnel, research authorities, other personnel involved with similar projects, information systems professionals, and state administrators involved in the identification and development of office automation curriculum were helpful in providing direction and information to the researcher in developing the scope of this study.

The review of literature, discussions, and other databases resulted in the formulation of a basic definition of information systems, the identification of basic competencies, and the selection of the methodology utilized in this study.

The DACUM Committee

The DACUM approach involves using a committee of ten to twelve resource persons who are experts in a particular occupation to analyze and identify the competencies and tasks critical in the particular field of study. The DACUM process is especially suited for researching competencies in the development of new educational programs and, for this reason, was chosen for this study.

Sixteen DACUM committee members were selected for this study. They were selected on the basis of experience or expertise in information systems, automated office-related subjects, information/word processing, data processing, office procedures, business communications, or other related areas. Committee members represented a wide variety of businesses and organizations and were recommended or volunteered to be involved in this study. Access to the DACUM committee in this study was limited, and a modified approach was taken: Initial extensive literature reviews were undertaken prior to the committee's meeting in order to develop a basic list of competencies; the profile chart was tentatively developed by the DACUM committee; and the researcher served as both coordinator, facilitator, and recorder for the DACUM committee meeting. The DACUM committee members who participated in this study are listed in Appendix A.

The DACUM committee was asked to determine broad competency areas in which individual competency statements could be identified. The broad component areas that were identified by the DACUM committee in this study were:

BUSINESS SKILLS
COMMUNICATIONS SKILLS
INTERPERSONAL SKILLS
MANAGEMENT SKILLS
PROBLEM SOLVING SKILLS
INTRAPRENEURIAL SKILLS
TECHNOLOGICAL SKILLS

In addition, an eighth broad category, GENERAL EDUCATION SKILLS, was identified; however, no competency statements were developed separately for this category.

Next, the DACUM committee was asked to list the competencies (tasks) which would be needed to develop skills in the identified broad component areas. Lastly, a tentative questionnaire instrument, which included the eight broad components and supporting competency statements, was compiled by the researcher. A four-point Likert-type scale (4-1) was developed which required a response in one of four ways: 4 = ESSENTIAL, 3 = VERY IMPORTANT, 2 = SOMEWHAT IMPORTANT, and 1 = NON-ESSENTIAL. The Likert-type scale is employed in this study to further delineate the ranking of the already-identified necessary skills for a particular profession, i.e., workers in information occupations.

Development of the Information Systems Occupational Competencies Questionnaire

The data in this study were collected through two iterations of the Information Systems Occupational Competencies Questionnaire. The format of the instrument was as follows: Part I identified eight basic components (broad areas) for persons in information systems occupations. These components were: Business Skills, Communications Skills, Interpersonal Skills, Management/Problem Solving/Intrapreneurial Skills, Technological Skills, and General Education Skills. Respondents were asked to indicate whether the components were Essential

(4), Very Important (3), Somewhat Important (2), or Non-Essential (1). Part II of the questionnaire identified 304 basic competencies (tasks) within the broad component areas. Using a Likert-type scale, the format for each of the 304 competency statements required individuals in the survey population to respond in one of four ways--Essential (4), Very Important (3), Somewhat Important (2), or Non-Essential (1). Management Skills, Problem Solving Skills, and Intrapreneurial Skills were treated as separate sections in Part II of the questionnaire.

Two iterations of the questionnaire were accomplished, as follows:

INFORMATION SYSTEMS OCCUPATIONAL COMPETENCIES SURVEY #1 (Appendix C), sent out in the first round of the questionnaire, consisted of 8 broad component areas and 304 competency statements. It was sent to 1,017 AISP members who were self selected into the study.

INFORMATION SYSTEMS OCCUPATIONAL COMPETENCIES SURVEY #2 (Appendix D), sent out in the second round of the questionnaire, consisted of 8 broad component areas and 313 competency statements. It was sent to 657 AISP members who participated in the first round of the questionnaire. Nine additional competencies concerning communications, interpersonal, and technological skills were added to the second round of the questionnaire as a result of suggestions from the participants. Also, two categories were added during the second round of the questionnaire because of respondent input: (1) a five-question section regarding prerequisites for persons entering an information systems occupation, and (2) a question regarding the level of employee the respondents had in mind while completing the questionnaire. The responses for each of the categories of questions are presented in tabular form in Chapter IV.

Each participant was asked to sign his/her name and address to a statement which insured that no individual or institution would be identified in any publicity or publication which may result from the study. Concurrently, each respondent was informed that the study had been approved by the University of Houston Committee for the Protection of Human Subjects.

During the first round of the questionnaire, a demographic datasheet was included. This tabulated datasheet appears in Appendix E.

PILOT TEST

Because of their familiarity with the intent of the study and the content of the questionnaire, the DACUM committee was utilized as the pilot group to critique the questionnaire on clarity and brevity of statements, presentation of the instructions, length of the instrument, scaling, and format. Fifteen of the sixteen DACUM committee members participated in the pilot test.

As a result of the pilot test, minor changes were made to clarify competency statements and presentation of the instrument instructions. Two additional competency statements were added to the questionnaire. The length of the instrument, although very inclusive, was approved. The questionnaire sent out in during the first round included 8 broad components and 304 competency statements.

STUDY POPULATION

The study population was identified as current members of the Association of Information Systems Professionals (AISP), using the self selection process. The membership of AISP is composed nationally of 5,454 professionals employed in businesses, industries, service industries, government agencies, or educational institutions. The individuals who belong to AISP may work at all levels in their organizations or may own their own businesses in the areas of information systems management, information systems implementation and consultation, information systems operations, word and information processing, and information systems networking.

Many of the members of AISP have obtained a certification recognizing them as systems professionals. This recognition is the result of sitting for and passing the Certified Systems Professional (CSP) examination which was developed to set a standard of excellence for systems professionals. This examination was developed in 1984 by the Association of Systems Management. It was put in place and administered for the first time in 1986 by the Institute for Certification of Computer Professionals (ICCP). The specific objectives of this examination, as outlined by the ICCP, are (1) to identify systems practitioners who have attained a specified level of knowledge and experience in the principles and practices of systems, information resource management, and related disciplines; (2) to provide tools, guidelines, and assessment methods necessary to achieve professional status; (3) to foster continuing professional development; and (4) to delineate, and encourage adherence to, professional standards for those in the information systems profession (ICCP 1986 Program Announcement, p. 1).

DATA COLLECTION

The Delphi technique is an intuitive method of research in which a group of experts attempts to arrive at a consensus in an atmosphere free from intimidation and pressure. Generally, Delphi members respond to two or more iterations of a questionnaire. The Delphi technique in this study was modified to accommodate the DACUM approach; i.e., only two rounds of the questionnaire were sent to the panel of experts.

The Delphi technique for the collection of data in this study was developed and maintained as follows:

(1) The researcher sent letters to each of the 5,454

national members of AISP. The letter provided complete information about the objectives and procedures of the study. Each member was invited to indicate his/her willingness to serve as a panel member by returning and completing a form enclosed with the letter. The Delphi study population for the first round of this study was composed of 1,017 AISP members (18.8%), representing 46 states and the District of Columbia, who responded positively to be included in the study.

(2) Correspondence accompanying the first round of the questionnaire solicited additions, deletions, comments and suggestions from the respondents, as well as expressing appreciation for participation in the study.

(3) During the second round of the questionnaire changes or additions, as well as the median response of each item from the first round were included. Comments were solicited again from the respondents. The second-round questionnaire was sent to the 657 respondents who participated in the first round.

The three letters sent to the AISP membership appear in Appendix B.

DATA ANALYSIS

The time and effort required to enter data from a comprehensive questionnaire of this type is considerable; thus, many avenues were explored. It was determined that the inmates working in the Records Conversion Facility

(RCF) at the Wynne Unit of the Texas Department of Corrections in Huntsville, Texas, were best equipped to handle large data-entry projects and studies of this kind. The data from the two questionnaires were entered onto computer tapes and downloaded into the AS-9000N computer at the University of Houston Computing Center for analysis.

The statistical analysis of the data in this study was accomplished with the use of medians, interquartile ranges, means, and standard deviations. These computerized statistical programs were available through the Statistical Package for the Social Sciences (SPSSX), University Computing Center, University of Houston.

The following criteria were used to determine whether an item was a necessary or a less important skill:

1. A component or competency statement was considered to be necessary if it received a median score of 4 (Essential) or 3 (Very Important) during the second round of the questionnaire. Respondents were considered to have reached consensus if there was a reduction in variance (i.e., a smaller interquartile range from Round One to Round Two) for a component or competency.

2. A component or competency statement was considered to be less important if it received a median score of 2 (Somewhat Important) or 1 (Non-Essential) during the second round of the questionnaire. Respondents were considered to have reached consensus if there was a

reduction in variance (evidenced by a smaller interquartile range from Round One to Round Two) for a component or competency.

3. On statements that showed a reduction in variance (evidenced by a smaller interquartile range from Round One to Round Two), it was clear that greater agreement resulted in Round Two than in Round One. More agreement in Round Two than in Round One, per item, was an indication that the Delphi process was working.

4. One additional step was taken in order to identify distinctive clusters of competencies. This step was called the Analysis of Distinction and was utilized to rank order the statements by means computed in Round Two. For this analysis, the criterion was set as follows: a) a component or competency was considered to be "Essential" for information systems workers if it received a mean rating of 3.51 or higher; b) a component or competency was considered to be "Very Important" for information systems workers it if received a mean rating of 2.51-3.50; and c) a component or competency was considered to be "Somewhat Important" for information systems workers if it received a mean rating of 2.50 or below.

In conducting this study, two methodologies were used--the DACUM committee approach and the Delphi technique--both of which rely strongly on the input of practitioners in the field of study. Expectations were high that strong agreement on the listing of competencies would result during the Delphi process and that normal differences between group members would not be present. One additional statistical analysis, an Analysis of Distinction, was undertaken to provide information on distinctive clusters of competencies.

CHAPTER IV

PRESENTATION AND ANALYSIS OF DATA

The purpose of this study was to identify the competencies which will be required of information systems workers in automated offices as perceived by information systems professionals. Identified competencies reflecting the changes which are taking place in the office can be utilized to modify present curricula, develop new curricula, enhance on-the-job training, and prepare teachers to teach the necessary skills. Then, students can be trained adequately to compete for and maintain positions in occupations becoming more and more dependent on information.

THE DELPHI ANALYSIS

Response Rate. As a result of the letters mailed to all 5,454 national members of the Association of Information Systems Professionals (AISP) in May, 1987, positive responses were received from 1,017 members (18.8%), representing forty-six states and the District of Columbia. More specific demographic data on the study population are available in Appendix E.

A total of 667 responses (65.58%) from the 1,017 who were self selected into the study were received in the first round of the questionnaire. Ten questionnaires were unusable due to mail handling or were returned unanswered. Therefore, 657 responses (64.60%) were utilized in Round

One.

In the second round of the questionnaire, 482 responses (73.36%) were received from the 657 who participated in Round One. Seven responses were unusable, making a total of 475 usable responses (72.30%). Arrayed in Table 1 are the number and percentage of the responses. The number of AISP members who participated in the study by state is shown in Appendix F.

A STUDY TO IDENTIFY
COMPETENCIES FOR INFORMATION SYSTEMS WORKERS

Table 1

Number and Percentage of Responses for Rounds One and Two

Round	Mailed	Returned	Unusable	Usable	% of Response
One	1,017	667	10	657	64.60
Two	657	482	7	475	72.30

Basic Components

Part I of the Information Systems Occupational Competencies Questionnaire focused on broad, distinctive categories into which the individual competency statements would be listed. The purpose of identifying these broad categories was to present an overview of the necessary elements for successful maintenance of a job in Information Systems. For both rounds of the questionnaire, the following eight items were included in this section:

BUSINESS SKILLS
COMMUNICATIONS SKILLS
INTERPERSONAL SKILLS
MANAGEMENT/PROBLEM SOLVING/INTRAPRENEURIAL SKILLS
TECHNOLOGICAL SKILLS
GENERAL EDUCATION SKILLS

Responses containing the medians and interquartile ranges for both Round One and Round Two for each item are reported in Table 2. (For purposes of reporting the data, the column marked "Item #" reflects the item number on the questionnaire. All items will be reported in this same manner for all tables.)

The higher the median, the greater the value of the item. The greater the value of the item, the stronger the consideration as a necessary competency for information systems workers.

The eight components--BUSINESS SKILLS, COMMUNICATIONS SKILLS, INTERPERSONAL SKILLS, MANAGEMENT/PROBLEM SOLVING/INTRAPRENEURIAL SKILLS, TECHNOLOGICAL SKILLS, and GENERAL EDUCATION SKILLS--were rated as "Essential" or "Very Important" competencies for information systems workers and met the criteria as necessary competencies. Greater agreement was reached by the respondents for BUSINESS SKILLS and INTERPERSONAL SKILLS, reaching consensus in Round Two. It would appear that the respondents have identified the broad skill areas in which worker competency must be demonstrated in order to compete for and maintain positions in information systems

A STUDY TO IDENTIFY
COMPETENCIES FOR INFORMATION SYSTEMS WORKERS
TABLE 2
BASIC COMPONENTS
Responses from Delphi Panel

Item #	Statement	Median (I-Q Range) Round 1 n=657	Median (I-Q Range) Round 2 n=475
*10	BUSINESS SKILLS. Business skills include knowledge of the organizational, procedural, ethical, and analytical nature of the office.	3.00 (3.00-4.00)	3.00 (3.00-3.00)
*20	COMMUNICATIONS SKILLS. Communications skills include the human and technical skills used in writing, speaking, listening, and nonverbal communications.	4.00 (4.00-4.00)	3.00 (3.00-4.00)
*30	INTERPERSONAL SKILLS. Interpersonal skills include behavioral job skills.	3.00 (3.00-4.00)	4.00 (4.00-4.00)
*40	MANAGEMENT/PROBLEM SOLVING/INTRAPRENEURIAL SKILLS. These skills include functions associated with planning, leading, controlling, goal setting; recognition, definition, analysis of problems and implementation of solutions; and entrepreneurial-like skills used in the office.	3.00 (3.00-4.00)	3.00 (3.00-4.00)
*50-60	TECHNOLOGICAL SKILLS. Technological skills include the ability to manipulate equipment, hands-on skills, etc.	4.00 (3.00-4.00)	3.00 (3.00-4.00)
*70	GENERAL EDUCATION SKILLS. General education skills include English (grammar, spelling, and punctuation), speech, math, science, etc.	3.00 (3.00-4.00)	4.00 (3.00-4.00)

*Identified as a necessary component for information systems workers.

occupations.

Comments from the respondents support the findings in this section of the study:

> Information Systems [is] are a tool for efficient and more complete communication. Technology must not be invoked at the expense of communication. IS professionals must always balance new technology with the purely social needs of humans and not let it get in the way of interpersonal relationships.
>
> Specific skills I find extremely important are the basics--grammar, spelling, ability to communicate effectively, reliability, punctuality, sense of responsibility, follow-through, and being a team player.
>
> I feel that the key component is people skills. Trying to communicate your information systems knowledge to others requires the ability to know how to go about sharing that knowledge.
>
> I cannot stress enough the importance of general education particularly basic language and writing skills...
>
> Human element important; ability to communicate/listen, essential.
>
> A solid background on organizations and how they operate and manage people is very important. Knowing how to work in teams is essential in the information systems field.
>
> Communications and interpersonal skills are essential for accessing and disseminating information. There are too many key people in IS environments who can only communicate via a keyboard which is not only a handicap to the person but also to the organization.
>
> These skills (components) are all essential and relevant...the overall emphasis on business, communication, and interpersonal rather than technical is the proper one.

Basic Competencies (Tasks)

Competencies (tasks) were defined as the skills, attitudes, or knowledges which an information systems worker must be able to demonstrate. Part II of the Information Systems Occupational Competencies Questionnaire included basic task competencies for information systems workers in the following skill areas: BUSINESS SKILLS, COMMUNICATIONS SKILLS, INTERPERSONAL SKILLS, MANAGEMENT SKILLS, PROBLEM SOLVING SKILLS, INTRAPRENEURIAL SKILLS, and TECHNOLOGICAL SKILLS. These skill areas correspond to the broad components in Part I of the questionnaire. Basic task competencies were not developed for the GENERAL EDUCATION SKILLS area. The item was included as a broad general component by the DACUM panel in order to verify and affirm what was identified in the literature. Each of these sections is treated separately below.

BUSINESS SKILLS. BUSINESS SKILLS were defined as knowledge of the organizational, procedural, ethical, and analytical nature of the office. There were 16 items in this section in the first round of the questionnaire. A total of 17 items were rated during the second round since one additional statement was added from Round One input.

Responses containing the medians and interquartile ranges for both Rounds One and Two for each statement are reported in Table 3. The higher the median, the greater the value of the item; the smaller the interquartile range,

A STUDY TO IDENTIFY COMPETENCIES FOR INFORMATION SYSTEMS WORKERS

TABLE 3

BUSINESS SKILLS

Responses from Delphi Panel

Item #	Statement	Median (I-Q Range) Round 1 n=657	Median (I-Q Range) Round 2 n=475
*100	Work within and support the organization's ethical structure.	3.00 (3.00-4.00)	4.00 (3.00-4.00)
*101	Develop a set of personal ethics.	3.00 (3.00-4.00)	3.00 (3.00-4.00)
*102	Identify and work within the basic procedures and systems in the office; (e.g., accounting, budgeting, inventory, payroll, etc.).	3.00 (3.00-4.00)	3.00 (3.00-4.00)
*103	Describe the importance of individuals within the office.	3.00 (2.00-3.00)	3.00 (3.00-4.00)
*104	Outline the steps in a problem-solving process and apply to information systems.	3.00 (3.00-4.00)	3.00 (2.00-3.00)
*105	Identify the main characteristics of the various forms of organization (e.g., formal, line-staff, matrix, information, functional, line, etc.).	2.00 (2.00-3.00)	3.00 (3.00-4.00)
106	Identify the main functions of management and how they apply to the automated office.	3.00 (2.00-3.00)	2.00 (2.00-3.00)
*107	Develop objectives, milestones, measure work progress, and organize for project planning and control.	3.00 (3.00-4.00)	3.00 (2.00-3.00)
*108	Analyze business organizational structure for the best methods of achieving goals and productivity.	3.00 (2.00-3.00)	3.00 (3.00-3.00)

*Identified as a necessary competency for information systems workers.

A STUDY TO IDENTIFY
COMPETENCIES FOR INFORMATION SYSTEMS WORKERS
TABLE 3, concluded

Item #	Statement	Median (I-Q Range) Round 1 n=657	Median (I-Q Range) Round 2 n=475
*109	Work within the organizational structure to get the job done.	3.00 (3.00-4.00)	3.00 (3.00-3.00)
*110	Apply statistical methods to analyze current economic conditions, database information, and market research.	2.00 (2.00-3.00)	3.00 (3.00-4.00)
111	Apply evaluation techniques to analyze procedures, data flow, problem areas, programs, work scheduling, and control in order to effect cost reductions.	3.00 (2.00-4.00)	2.00 (2.00-3.00)
*112	Develop and maintain good working relationships with persons inside the organization.	4.00 (3.00-4.00)	3.00 (3.00-3.00)
*113	Develop and maintain good working relationships with vendors, distributors, and outside consultants.	3.00 (3.00-4.00)	4.00 (4.00-4.00)
*114	Develop, revise, disseminate, and explain to co-workers information systems procedures and policies.	3.00 (3.00-4.00)	3.00 (3.00-4.00)
*115	Become familiar with business terminology as it applies to any given business environment.	3.00 (3.00-4.00)	3.00 (3.00-4.00)
*116	Use the proper resources within an organization to find the information needed.		3.00 (2.00-3.00)

*Identified as a necessary competency for information systems workers.

the greater the group consensus.

Of the 17 competency statements in this section, 15 items received "Essential" or "Very Important" ratings. It would appear that these competencies would be needed by workers in information systems. The 15 necessary competencies fell into the following categories of competencies: ethics, human relations, problem solving, organizational brightness (structure, characteristics, and economic outlook), project planning, and developing procedures and policies related to information systems. Two items, having to do with management functions and evaluation techniques and procedures, received "Somewhat Important" ratings. Stronger agreement was evidenced by consensus on five of the seventeen items. Four of the five consensus items, having to do with human relations and organizational brightness, were rated as "Essential" or "Very Important." The fifth item, having to do with evaluation techniques, reached consensus as "Somewhat Important."

Thus, 15 (88.23%) of the 17 competency statements in the BUSINESS SKILLS component area were stipulated as "Essential" or "Very Important" competencies for information systems workers.

Although 15 of the 17 items in this category met the criteria as necessary competencies for information systems workers, several comments offered by a number of the respondents reflected difficulty with this skill area, as follows:

> ...the BUSINESS SKILLS component may be too difficult to define since every organization, department varies in management styles, expectations, and relationships.
>
> What you appear to be asking [an information systems worker] to demonstrate will probably not be what he is expected to demonstrate in a working environment (emphasis panelists').
>
> Management changes weekly--every manager has her/his own styles.
>
> Several of the questions were difficult for me to respond to. For example, business terminology may be learned "on-the-job" rather than in business or professional classes. A more appropriate question regarding organizational structure may have been to ask about the use of organization charts.

COMMUNICATIONS SKILLS. COMMUNICATIONS SKILLS were defined as those that include the human and technical skills used in writing, speaking, listening, and nonverbal communication. The data generated for this component are shown in Table 4. The higher the median, the greater the value of the item; the smaller the interquartile range, the greater the group consensus.

There were 63 items in this section in Round One. In Round Two, four items were moved to another section of the questionnaire (see TECHNOLOGICAL SKILLS section). Two new items, 259 "proofreading" and 260 "networking", were added to the COMMUNICATIONS SKILLS section at the suggestion of several respondents. In Round Two, 61 items are presented

A STUDY TO IDENTIFY
COMPETENCIES FOR INFORMATION SYSTEMS WORKERS

TABLE 4

COMMUNICATIONS SKILLS

Responses from Delphi Panel

Item #	Statement	Median (I-Q Range) Round 1 n=657	Median (I-Q Range) Round 2 n=475
Indicate the importance of each of the communications skills below:			
*200	Verbal	4.00 (3.00-4.00)	3.00 (3.00-3.00)
*201	Nonverbal	3.00 (3.00-4.00)	3.00 (3.00-4.00)
*202	Listening	4.00 (4.00-4.00)	4.00 (4.00-4.00)
*203	Written	4.00 (3.00-4.00)	3.00 (3.00-4.00)
*204	Questioning	4.00 (3.00-4.00)	4.00 (4.00-4.00)
*205	Grammar	4.00 (3.00-4.00)	4.00 (4.00-4.00)
*206	Punctuation	4.00 (3.00-4.00)	4.00 (3.00-4.00)
*207	Telephone techniques	3.00 (3.00-4.00)	4.00 (4.00-4.00)
Using automated equipment with appropriate software and peripherals, keyboard/format:			
*208	letters	4.00 (3.00-4.00)	4.00 (3.00-4.00)
*209	memos	4.00 (3.00-4.00)	3.00 (3.00-4.00)
*210	reports	4.00 (3.00-4.00)	4.00 (3.00-4.00)
Using automated equipment with appropriate software and peripherals, revise:			
*211	letters	4.00 (3.00-4.00)	4.00 (3.00-4.00)
*212	memos	4.00 (3.00-4.00)	4.00 (4.00-4.00)
*213	reports	4.00 (3.00-4.00)	4.00 (3.00-4.00)
Using automated equipment with appropriate software and peripherals, compose:			
*214	letters	3.00 (3.00-4.00)	4.00 (3.00-4.00)
*215	memos	3.00 (3.00-4.00)	4.00 (3.00-4.00)
*216	reports	3.00 (3.00-4.00)	3.00 (3.00-4.00)

*Identified as a necessary competency for information systems workers.

A STUDY TO IDENTIFY
COMPETENCIES FOR INFORMATION SYSTEMS WORKERS
TABLE 4, continued

Item #	Statement	Median (I-Q Range) Round 1 n=657	Median (I-Q Range) Round 2 n=475
*217	Receive and transmit messages from traditional sources; (e.g., telephone, face-to-face, mail systems, etc.).	3.00 (3.00-4.00)	3.00 (3.00-4.00)
*218	Listen actively when given directions, asking for clarification when unsure.	4.00 (4.00-4.00)	3.00 (3.00-4.00)
*219	Define concepts in telecommunications.	3.00 (2.00-3.00)	3.00 (3.00-4.00)

Indicate the importance of the knowledge of the telecommunications concepts, terminology, and media listed below:

Item #	Statement	Median (I-Q Range) Round 1 n=657	Median (I-Q Range) Round 2 n=475
*220	Channels	2.00 (2.00-3.00)	4.00 (4.00-4.00)
*221	Lines	2.00 (2.00-3.00)	3.00 (3.00-3.00)
222	Circuits	2.00 (2.00-3.00)	2.00 (2.00-2.00)
223	Paths	2.00 (2.00-3.00)	2.00 (2.00-2.00)
224	Telephone cables	2.00 (2.00-3.00)	2.00 (2.00-2.00)
225	Coaxial cables	2.00 (2.00-3.00)	2.00 (2.00-2.00)
226	Microwave systems	2.00 (2.00-3.00)	2.00 (2.00-2.00)
227	Satellites	2.00 (2.00-3.00)	2.00 (2.00-3.00)
228	Fiber optics	2.00 (2.00-3.00)	2.00 (2.00-2.00)
229	Modems	3.00 (2.00-4.00)	2.00 (2.00-2.00)
230	Broadband	2.00 (2.00-3.00)	2.00 (2.00-3.00)
*231	Baseband	2.00 (2.00-3.00)	3.00 (3.00-3.00)
232	Asynchronous	3.00 (2.00-4.00)	2.00 (2.00-3.00)
233	Bisynchronous	3.00 (2.00-3.00)	2.00 (2.00-3.00)
*234	Protocol	3.00 (2.00-4.00)	3.00 (2.00-3.00)

*Identified as a competency for information systems workers.

A STUDY TO IDENTIFY
COMPETENCIES FOR INFORMATION SYSTEMS WORKERS
TABLE 4, continued

Item #	Statement	Median (I-Q Range) Round 1 n=657	Median (I-Q Range) Round 2 n=475
Indicate the importance of knowledge about the telecommunications systems listed below:			
*235	Telephone	4.00 (3.00-4.00)	3.00 (2.00-3.00)
*236	PBX	3.00 (2.00-3.00)	3.00 (2.00-3.00)
*237	PABX	3.00 (2.00-3.00)	4.00 (3.00-4.00)
*238	Facsimile	3.00 (2.00-4.00)	3.00 (2.00-3.00)
*239	Telex	3.00 (2.00-3.00)	3.00 (2.00-3.00)
*240	TWX	2.00 (2.00-3.00)	3.00 (3.00-3.00)
*241	Electronic mail	3.00 (3.00-4.00)	3.00 (2.00-3.00)
*242	Voice mail/messaging	3.00 (2.00-4.00)	3.00 (2.00-3.00)
*243	Communicating word/information processors (dedicated, PC's, host)	3.00 (3.00-4.00)	3.00 (3.00-4.00)
Using dictating machine/recorder, dictate:			
*244	letters	3.00 (2.00-3.00)	3.00 (3.00-4.00)
*245	memos	3.00 (2.00-3.00)	3.00 (3.00-4.00)
*246	reports	2.00 (2.00-3.00)	3.00 (2.00-3.00)
Set up, revise, and disseminate operating guidelines in an office for:			
*247	dictation equipment	3.00 (2.00-3.00)	3.00 (2.00-3.00)
248	telecommunications equipment	3.00 (3.00-4.00)	2.00 (2.00-3.00)
*249	hardware	3.00 (3.00-4.00)	3.00 (2.00-3.00)
*250	software	3.00 (3.00-4.00)	3.00 (3.00-3.00)
*251	Develop and prepare visual aids for use in presentations.	3.00 (2.00-3.00)	3.00 (3.00-3.00)

*Identified as a necessary competency for information systems workers.

A STUDY TO IDENTIFY
COMPETENCIES FOR INFORMATION SYSTEMS WORKERS
TABLE 4, concluded

Item #	Statement	Median (I-Q Range) Round 1 n=657	Median (I-Q Range) Round 2 n=475
*252	Design, organize data for, and create visual aids for use in presentations.	3.00 (2.00-3.00)	3.00 (3.00-3.50)
*253	Make oral presentations.	3.00 (2.00-4.00)	3.00 (2.50-3.00)
*254	Identify the major barriers to communication that a person may encounter in an organization.	3.00 (2.00-4.00)	3.00 (3.00-3.00)
*255	Explain the importance of the different kinds of nonverbal communication in the messages transmitted and received.	3.00 (2.00-3.00)	3.00 (3.00-4.00)
*256	Explain how formal (upward, downward) communication networks are used in the office.	3.00 (2.00-3.00)	3.00 (3.00-3.00)
*257	Explain how informal (lateral) communication networks are used in the office.	3.00 (2.00-3.00)	3.00 (3.00-3.00)
*258	Define the part that timeliness of a message plays in the communication process.	3.00 (3.00-4.00)	3.00 (3.00-3.00)
*259	Proofreading		3.00 (3.00-3.00)
*260	Networking		3.00 (3.00-4.00)

*Identified as a necessary competency for information systems workers.

and analyzed.

Based on the stipulated criteria for a necessary competency for information systems workers, 49 (80.32%) of the 61 items received an "Essential" or a "Very Important" rating during Round Two of the questionnaire. The "Essential" or "Very Important" competencies for information systems workers cover the gamut of human communications skills such as verbal, listening, questioning, keyboarding/ formatting, composition, dictation, proofreading, receiving and transmitting messages, designing and preparing visual aids for presentations, and identification of factors in the communication process to the more nontraditional communications skills which have emerged as a result of new technology, such as knowledge of various telecommunications concepts, terminology, media, and systems.

The 12 items which were rated "Somewhat Important" and which met the criteria for less important competencies related specifically to technical telecommunications concepts, terminology, and media.

Respondents evidenced stronger agreement on 27 (44.26%) of the 61 items by reaching consensus. Of the 27 items, 19 (70.37%) received consensus as "Essential" or "Very Important" having to do with traditional human communications skills (listening, questioning, grammar, telephone techniques, verbal, and written); communications process skills (identification of barriers to communications and utilization of the formal and informal communications networks); and a number of communications skills related to telecommunications concepts, terminology, media, and systems. The 8 items on which consensus was reached as "Somewhat Important" related solely to knowledge of technical telecommunications concepts, terminology, and media.

Respondents' written comments supported the findings in the data that human communication skills are more necessary competencies for information systems workers than technical communication skills. One panelist stated that

> technical skills are only necessary for the systems engineer or telecommunications equipment specialist.

Another respondent pointed out that:

> It is difficult to integrate office systems if the key individual, no matter how technically proficient, is unable to communicate those ideas. Communication can take the form of written documentation, verbal instructions to an end-user, and writing of policies/procedures...

A similar comment from another respondent supported this viewpoint:

> I feel that COMMUNICATIONS SKILLS are the most essential of the components. Failure to convey ideas and goals articulately to both subordinates and superiors is most certain to lead to overall failure in the profession.

A number of individuals in the study population pointed out that the skill of being able to articulate one's ideas and opinions is critical to success in information systems.

INTERPERSONAL SKILLS. INTERPERSONAL SKILLS were defined as behavioral job skills. There were 50 items in this section in the first round of the questionnaire. A total of 51 items were rated during the second round since one additional statement was added from Round One input. Table 5 displays the data produced in Rounds One and Two. The higher the median, the greater the value of the item; the smaller the interquartile range, the greater the group consensus.

Of the 51 competency statements relating to interpersonal skills, 50 were rated "Essential" or "Very Important". Only one statement, concerning ability to work independently, received a "Somewhat Important" rating. The stipulated criterion as necessary competencies was satisfied by 50 (98.01%) of the 51 items.

Consensus agreement by the respondents was reached on 23 (45.09%) of the 51 items. An analysis of the consensus items shows that the interpersonal skills of negotiation, personal appearance, loyalty, human relations, goal setting, time management, personal development, creativity, job skills, enthusiasm, willingness to learn new things, attitude, acceptance of criticism, knowledge of and adherence to company policies and procedures, productivity, and leadership ability received stronger support as

A STUDY TO IDENTIFY
COMPETENCIES FOR INFORMATION SYSTEMS WORKERS
TABLE 5
INTERPERSONAL SKILLS
Responses from Delphi Panel

Item #	Statement	Median (I-Q Range) Round 1 n=657	Median (I-Q Range) Round 2 n=475
Indicate the importance of the interpersonal skills listed below:			
*300	Communications	4.00 (4.00-4.00)	4.00 (3.00-4.00)
*301	Delegation	3.00 (3.00-4.00)	3.00 (3.00-4.00)
*302	Negotiation	3.00 (3.00-4.00)	4.00 (4.00-4.00)
*303	Persuasion	3.00 (3.00-4.00)	3.00 (3.00-4.00)
*304	Motivation	4.00 (3.00-4.00)	3.00 (3.00-4.00)
*305	Sense of humor	3.00 (3.00-4.00)	3.00 (3.00-4.00)
*306	Personal appearance	3.00 (3.00-4.00)	4.00 (4.00-4.00)
*307	Neatness of work, work area	3.00 (3.00-4.00)	3.00 (3.00-4.00)
*308	Dependability	4.00 (4.00-4.00)	3.00 (3.00-4.00)
*309	Reliability	4.00 (4.00-4.00)	3.00 (3.00-4.00)
*310	Time management	4.00 (3.00-4.00)	4.00 (4.00-4.00)
*311	Concept of self	3.00 (3.00-4.00)	4.00 (4.00-4.00)
*312	Loyalty	3.00 (3.00-4.00)	4.00 (4.00-4.00)
*313	Sense of urgency/meeting deadlines	4.00 (3.00-4.00)	3.00 (3.00-4.00)
*314	Pride in self, work, department, and company	4.00 (3.00-4.00)	3.00 (3.00-4.00)
*315	Getting along with people (all levels)	4.00 (3.00-4.00)	4.00 (4.00-4.00)
*316	Setting and meeting goals	4.00 (3.00-4.00)	4.00 (4.00-4.00)
*317	Personal development plans/goals	3.00 (3.00-4.00)	4.00 (4.00-4.00)
*318	Problem solving	4.00 (3.00-4.00)	4.00 (3.00-4.00)
*319	Decision making/judgment	4.00 (3.00-4.00)	3.00 (3.00-4.00)
*320	Professionalism (including ethics, morals, values)	4.00 (3.00-4.00)	4.00 (3.00-4.00)
*321	Community involvement (service)	2.00 (2.00-3.00)	4.00 (3.00-4.00)
*322	Initiative/self-starter	3.00 (3.00-4.00)	4.00 (4.00-4.00)
323	Ability to work independently	4.00 (3.00-4.00)	2.00 (2.00-3.00)
*324	Planning and organizing	3.00 (3.00-4.00)	3.00 (3.00-4.00)

*Identified as a necessary competency for information systems workers.

A STUDY TO IDENTIFY COMPETENCIES FOR INFORMATION SYSTEMS WORKERS

TABLE 5, concluded

Item #	Statement	Median (I-Q Range) Round 1 n=657	Median (I-Q Range) Round 2 n-475
*325	Interest in job	4.00 (3.00-4.00)	4.00 (4.00-4.00)
*326	Knowledge of job	4.00 (3.00-4.00)	4.00 (3.00-4.00)
*327	Leadership ability	3.00 (2.00-4.00)	4.00 (4.00-4.00)
*328	Creativity	3.00 (3.00-4.00)	4.00 (4.00-4.00)
*329	Attitude	4.00 (3.00-4.00)	3.00 (3.00-3.00)
*330	Attendance (on time, record of)	4.00 (3.00-4.00)	3.00 (3.00-4.00)
*331	Job skills	4.00 (3.00-4.00)	4.00 (4.00-4.00)
*332	Enthusiasm	3.00 (3.00-4.00)	4.00 (4.00-4.00)
*333	Risk taker	3.00 (2.00-3.00)	4.00 (4.00-4.00)
*334	"Extra" efforts	3.00 (3.00-4.00)	3.00 (3.00-4.00)
*335	Acceptance of criticism	3.00 (3.00-4.00)	3.00 (3.00-3.00)
*336	Team player	4.00 (3.00-4.00)	3.00 (3.00-4.00)
*337	Self-confidence	3.00 (3.00-4.00)	3.00 (3.00-4.00)
*338	Follow-up and follow-through	4.00 (3.00-4.00)	4.00 (3.00-4.00)
*339	Sense of responsibility	4.00 (3.00-4.00)	3.00 (3.00-4.00)
*340	Adventuresome (willing to learn new things)	4.00 (3.00-4.00)	4.00 (4.00-4.00)
*341	Training/teaching ability	3.00 (2.00-3.00)	4.00 (4.00-4.00)
*342	Helpfulness/cooperative	3.00 (3.00-4.00)	4.00 (3.00-4.00)
*343	Knowledge of and adherence to company policies and procedures	3.00 (3.00-4.00)	3.00 (3.00-3.00)
*344	Flexibilty	4.00 (3.00-4.00)	4.00 (3.00-4.00)
*345	Respect for work area and equipment	3.00 (3.00-4.00)	3.00 (3.00-4.00)
*346	Research skills	3.00 (2.00-3.00)	4.00 (4.00-4.00)
*347	Cost consciousness	3.00 (3.00-3.00)	3.00 (3.00-4.00)
*348	Maturity	3.00 (3.00-4.00)	3.00 (3.00-3.00)
*349	Productivity	3.00 (3.00-4.00)	3.00 (3.00-3.00)
*350	Honest, trustworthy		3.00 (3.00-4.00)

*Identified as a necessary competency for information systems workers.

necessary skills for information systems workers.

Many of the comments from the panelists can be summarized in these two statements:

> It is impossible to separate "people" skills versus "technical skills" in this area. To be successful you must have both if you have contact with people at all. Except for someone who sits in a room and "programs" without contact with "users" and, even then, they can't do an adequate job without sensitivity to user's needs.
>
> It would seem that personal characteristics count more than specific skills. Hardware and software change overnight; but honesty, inquisitiveness, energy, and interpersonal and communication skills enables [sic] IS personnel to keep up and forge ahead.

MANAGEMENT SKILLS. MANAGEMENT SKILLS were defined as those associated with planning, leading, controlling, and goal setting. Rounds One and Two included 25 items; the data are produced in Table 6. The higher the median, the greater the value of the item; the smaller the interquartile range, the greater the group consensus.

All 25 items included in this component were stipulated as "Essential" or "Very Important" competencies for information systems workers.

Group consensus (as evidenced by a smaller interquartile range from Round One to Round Two) was achieved on 15 (60%) of the 25 items with "Essential" or "Very Important" ratings. Setting goals, cost/benefit justification, control and organizational skills, determination of manpower and material needs, recommending

A STUDY TO IDENTIFY
COMPETENCIES FOR INFORMATION SYSTEMS WORKERS
TABLE 6
MANAGEMENT SKILLS
Responses from Delphi Panel

Item #	Statement	Median (I-Q Range) Round 1 n=657	Median (I-Q Range) Round 2 n=475
*400	Define the functions of management.	3.00 (2.00-3.00)	3.00 (3.00-4.00)
*401	Demonstrate the ability to set goals or plans for the information systems functions in an office.	3.00 (3.00-4.00)	4.00 (4.00-4.00)
*402	Demonstrate the ability to organize the information systems functions in an office.	3.00 (3.00-4.00)	3.00 (3.00-3.00)
*403	Demonstrate the ability to control the information systems functions in an office.	3.00 (3.00-4.00)	3.00 (3.00-3.00)
*404	Demonstrate the ability to lead or direct the people to attain the goals for information systems in an office.	3.00 (3.00-4.00)	3.00 (3.00-4.00)
*405	Determine the manpower needs for information systems in an office.	3.00 (3.00-4.00)	3.00 (3.00-3.00)
*406	Determine the materials needed for information systems functions in an office (e.g., hardware, software, media, peripherals, etc.).	3.00 (3.00-4.00)	3.00 (3.00-4.00)
*407	Prepare a budget for the elements of the information systems functions in an office.	3.00 (3.00-4.00)	3.00 (3.00-3.00)
*408	Create, revise, and disseminate the policies, procedures, and methods to be used in the information systems functions in an office.	3.00 (3.00-4.00)	3.00 (3.00-4.00)

*Identified as a necessary competency for information systems workers.

A STUDY TO IDENTIFY
COMPETENCIES FOR INFORMATION SYSTEMS WORKERS
TABLE 6, continued

Item #	Statement	Median (I-Q Range) Round 1 n=657	Median (I-Q Range) Round 2 n=475
	Research, evaluate, and make recommendations for setting up/maintaining/upgrading the following information systems functions in an office:		
*409	hardware	3.00 (3.00-4.00)	3.00 (3.00-3.00)
*410	software	3.00 (3.00-4.00)	3.00 (3.00-3.00)
*411	peripherals	3.00 (3.00-4.00)	3.00 (3.00-4.00)
*412	media	3.00 (2.00-3.00)	3.00 (3.00-4.00)
*413	training	3.00 (3.00-4.00)	3.00 (3.00-3.00)
*414	maintenance/service contracts	3.00 (2.00-3.00)	3.00 (3.00-3.00)
*415	lease/purchase agreements	3.00 (2.00-3.00)	3.00 (3.00-4.00)
*416	Be sensitive to the morale of the individuals in the office.	4.00 (3.00-4.00)	3.00 (3.00-3.00)
*417	Monitor the productivity of the information systems functions in an office.	3.00 (3.00-4.00)	3.00 (3.00-3.00)
*418	Develop and maintain good working relationships with vendors and distributors outside of the office.	3.00 (3.00-4.00)	3.00 (3.00-4.00)
*419	Develop and maintain good working relationships with persons at all levels in the office.	4.00 (3.00-4.00)	3.00 (3.00-4.00)
*420	Analyze the productivity and effectiveness of use and design of the information systems.	3.00 (3.00-4.00)	3.00 (3.00-3.00)
*421	Analyze the cost/benefit justification of the information systems in an office.	3.00 (3.00-4.00)	4.00 (4.00-4.00)

*Identified as a necessary competency for information systems workers.

A STUDY TO IDENTIFY
COMPETENCIES FOR INFORMATION SYSTEMS WORKERS
TABLE 6, concluded

Item #	Statement	Median (I-Q Range) Round 1 n=657	Median (I-Q Range) Round 2 n=475
*422	Maintain constant evaluation of equipment and network needs at the end-user level.	3.00 (3.00-4.00)	3.00 (3.00-4.00)
*423	Promote the information systems functions to all levels of the organization.	3.00 (3.00-4.00)	3.00 (3.00-3.00)
*424	Develop a marketing presentation package to sell to upper management.	3.00 (2.00-3.00)	3.00 (3.00-3.00)

*Identified as a necessary competency for information systems workers.

hardware systems, setting up training and maintenance/ service contracts, human relations considerations, productivity concerns, and promoting and selling the information systems functions to all levels of the organization appear to have stronger support from the respondents as necessary skills for information systems workers.

Comments from respondents indicated that

> a positive management attitude is essential to carry out effective procedures, direct subordinates, articulate desires, and evaluate information systems from all perspectives.

And that management skills are critical

> especially when starting up a new system and maintaining system effectiveness.

Still another respondent states that

> of course, these skills become more critical as a person moves into supervisory or management positions and may have less importance to someone in an administrative position.

PROBLEM SOLVING SKILLS. PROBLEM SOLVING SKILLS were defined as the recognition, definition, analysis of problems, and implementation of solutions. This section included 12 items in Rounds One and Two; Table 7 presents the findings. The higher the median, the greater the value of the item; the smaller the interquartile range, the greater the group consensus.

All 12 statements met the stipulated criterion as "Essential" or "Very Important" competencies for

A STUDY TO IDENTIFY
COMPETENCIES FOR INFORMATION SYSTEMS WORKERS

TABLE 7
PROBLEM SOLVING SKILLS
Responses from Delphi Panel

Item #	Statement	Median (I-Q Range) Round 1 n=657	Median (I-Q Range) Round 2 n=475
*425	Define and describe the problem.	4.00 (3.00-4.00)	3.00 (3.00-3.00)
*426	Explain how productivity may be dependent on adequate problem solving in the office.	3.00 (3.00-4.00)	3.00 (3.00-3.00)
*427	Analyze the situation to get the basic facts and feelings of the situation.	3.00 (3.00-4.00)	4.00 (4.00-4.00)
*428	Break down the problem into the essential elements and issues and clarify goals concerning the problem situation.	3.00 (3.00-4.00)	3.00 (3.00-3.00)
*429	Collect relevant/irrelevant data regarding the problem and issues.	3.00 (3.00-4.00)	3.00 (3.00-4.00)
*430	Develop and analyze alternate solutions to the problem.	3.00 (3.00-4.00)	3.00 (3.00-4.00)
*431	Choose from the options and compare defined goal with the possible ways of solving problem.	3.00 (3.00-4.00)	3.00 (3.00-3.00)
*432	Implement the solution.	3.00 (3.00-4.00)	3.00 (3.00-4.00)
*433	Create the kind of environment where problems are seen as challenges, not as roadblocks and stumbling stones.	4.00 (3.00-4.00)	3.00 (3.00-4.00)
*434	Be sensitive to the areas in an office where problems may arise; (e.g., human, economic, systems).	3.00 (3.00-4.00)	3.00 (3.00-4.00)
*435	Communicate the solution to the problem to the people involved, taking into account the factors of verbal and nonverbal communication.	4.00 (3.00-4.00)	3.00 (3.00-4.00)
*436	Involve the right people in the analysis, implementation, and evaluation of the problem and its solution.	4.00 (3.00-4.00)	3.00 (3.00-4.00)

*Identified as a necessary competency for information systems workers.

information systems workers.

Group consensus was evident on 5 (41.66%) of the 12 items, providing evidence that the Delphi process was working. The elements in the problem-solving process which received the strongest agreement among the respondents related to being able to define and describe the problem, recognize how productivity may be affected by adequate problem solving, analyze the facts and feelings of the problem situation, break down the problem into essential elements and issues, and compare options to solve the problem with the defined goals.

One respondent commented that

> solving problems is a strong indicator of how people deal with people and, for this reason, merits careful handling.

INTRAPRENEURIAL SKILLS. Many comments were received from respondents regarding what they perceived to be the incorrect spelling of "entrepreneurial". However, intrapreneurial is the term that has been associated with applying entrepreneurial principles in the work place. This was the definition used in this study. In this section, participants responded to 15 items in Rounds One and Two. Table 8 displays the data generated in this section. The higher the median, the greater the value of the item; the smaller the interquartile range, the greater the group consensus.

All 15 of the items in this component area were

A STUDY TO IDENTIFY
COMPETENCIES FOR INFORMATION SYSTEMS WORKERS
TABLE 8
INTRAPRENEURIAL SKILLS
Responses from Delphi Panel

Item #	Statement	Median (I-Q Range) Round 1 n=657	Median (I-Q Range) Round 2 n=475
*437	Analyze the boundaries of risk which an organization is willing to set for individuals.	3.00 (2.00-3.00)	4.00 (3.00-4.00)
*438	Analyze one's personal risk boundaries in order to determine the amount of risk one is willing to take to get the job done.	3.00 (2.00-3.00)	4.00 (4.00-4.00)
*439	Define the climate for change in an office environment (e.g., the expectations for, encouragement of, and the willingness of an organization to effect change in itself and in individuals.	3.00 (2.00-3.00)	3.00 (3.00-3.00)
*440	Determine the extent to which the individual is willing to accept or reject change within an office environment.	3.00 (2.00-3.00)	3.00 (3.00-3.00)
*441	Be aware of the effect of change on others in the organization.	3.00 (3.00-4.00)	3.00 (3.00-3.00)
*442	Outline the procedures and components of strategic planning.	3.00 (2.00-3.00)	3.00 (3.00-3.00)
*443	Determine the extent to which an individual is encouraged by an organization to develop himself/ herself.	3.00 (2.00-3.00)	3.00 (3.00-4.00)

*Identified as a necessary competency for information systems workers.

A STUDY TO IDENTIFY COMPETENCIES FOR INFORMATION SYSTEMS WORKERS

TABLE 8, concluded

Item #	Statement	Median (I-Q Range) Round 1 n=657	Median (I-Q Range) Round 2 n=475
*444	Determine the willingness of an organization to develop its human resources (e.g., the use of on-the-job and off-the-job professional development opportunities).	3.00 (2.00-3.00)	3.00 (3.00-3.00)
*445	Take advantage of opportunities to develop one's own capabilities on one's own time.	3.00 (3.00-4.00)	3.00 (3.00-3.00)
*446	Given a problem, use acquired knowledge to demonstrate the ability to analyze and evaluate a situation and present a workable solution in the best interest of the organization.	3.00 (3.00-4.00)	3.00 (3.00-3.00)
*447	Coordinate, set up, and conduct training for all levels of employees within an organization.	3.00 (2.00-4.00)	3.00 (3.00-4.00)
*448	Employ conflict resolution techniques in order to bring about positive outcomes of conflict.	3.00 (2.00-3.00)	3.00 (3.00-4.00)
*449	Demonstrate knowledge of feedback techniques in resolving conflict.	3.00 (2.00-3.00)	3.00 (3.00-3.00)
*450	Utilize negotiating skills in the office.	3.00 (3.00-4.00)	3.00 (3.00-3.00)
*451	Utilize persuasion skills in the office.	3.00 (3.00-3.00)	3.00 (3.00-3.00)

*Identified as a necessary competency for information systems workers.

specified as "Essential" or "Very Important" skills for information systems workers. Basically, these statements fell into the following clusters of competencies: risk, change, strategic planning, professional development, problem solving, training, conflict resolution, and utilization of negotiating and persuasion skills.

Group consensus was achieved on 12 (80%) of 15 items with a smaller interquartile range from Round One to Round Two, demonstrating that the Delphi process was working. Personal risk boundaries, change, strategic planning, professional development opportunities, problem solving, training, feedback skills, negotiating, and persuasion skills achieved the strongest support from the respondents.

Although there appeared to be some confusion regarding the term "intrapreneurial", the ratings for the fifteen items in this category showed very strong agreement among the respondents as to the importance of these competencies for the information systems worker.

TECHNOLOGICAL SKILLS. TECHNOLOGICAL SKILLS were defined as the ability to manipulate equipment, hands-on skills, etc. In Round One, respondents were asked to rate 117 competency statements; in Round Two, respondents were asked to rate 126 competency statements. Six new statements were added at the suggestion of the respondents (items 620, 621, 622, 623, 624 and 625); four items were moved from the COMMUNICATIONS SKILLS section to the

TECHNOLOGICAL SKILLS section, since it was pointed out that three of the items had more to do with hands-on manipulation of equipment than with human communication skills (items 235, 236, 237, and 238). Item 235 was determined to be a duplicate of item 587 in the TECHNOLOGICAL SKILLS section and was collapsed into item 587 during the second round of the questionnaire. Thus, there was a net gain of nine items in this section for Round Two of the survey. Table 9 displays the data produced in this section. The higher the median, the greater the value of the item; the smaller the interquartile range, the greater the group consensus.

Of the 126 competency statements in this section, 110 (87.30%) of the 126 items were stipulated as "Essential" or "Very Important" competencies for information systems workers. It is significant to this study to identify the clusters of competencies which were rated as "Essential" or "Very Important" competencies for information systems workers. These clusters of statements provide an insight into the hands-on technological skills which would be considered vital for successful entrance into and maintenance of a position in Information Systems. The clusters are:

1) Equipment Manipulation: "touch" proficiency of computer keyboard, including alphabetic, numeric, symbolic and function keys, as well as the 10-key pad; operation and care of input devices, such as keyboards, OCRs, communicating word processors, and voice processors; operation and care of peripheral devices, such as printers,

A STUDY TO IDENTIFY COMPETENCIES FOR INFORMATION SYSTEMS WORKERS
TABLE 9
TECHNOLOGICAL SKILLS
Responses from Delphi Panel

Item #	Statement	Median (I-Q Range) Round 1 n=657	Median (I-Q Range) Round 2 n=475
*500	Demonstrate "touch" proficiency in computer keyboard operation.	3.00 (3.00-4.00)	3.00 (3.00-3.00)
Specifically, "touch" proficiency of:			
*501	Alphabetic keys	4.00 (3.00-4.00)	3.00 (3.00-3.00)
*502	Numeric keys	3.00 (2.00-4.00)	3.00 (3.00-4.00)
*503	Symbolic keys	3.00 (2.00-3.00)	4.00 (3.00-4.00)
*504	Function keys	3.00 (2.00-4.00)	3.00 (3.00-4.00)
*505	10-key pad	3.00 (2.00-4.00)	3.00 (3.00-3.00)
Identify and operate the input elements of computers:			
*506	Keyboards	4.00 (3.00-4.00)	3.00 (3.00-3.00)
*507	OCRs	3.00 (2.00-3.00)	3.00 (3.00-3.00)
*508	Communicating word processors	3.00 (2.00-4.00)	4.00 (4.00-4.00)
*509	Voice processors	3.00 (2.00-3.00)	3.00 (3.00-3.00)
Identify and operate the peripherals of computers:			
*510	Printers	4.00 (3.00-4.00)	3.00 (3.00-4.00)
*511	Phototypesetters	2.00 (2.00-3.00)	3.00 (2.00-3.00)
*512	Modems	3.00 (2.00-4.00)	4.00 (4.00-4.00)
513	Microfilm	2.00 (2.00-3.00)	2.00 (2.00-3.00)
*514	Copiers	3.00 (2.00-4.00)	3.00 (3.00-4.00)
515	Facsimile	3.00 (2.00-3.00)	2.00 (2.00-3.00)
*516	Plotters	2.00 (2.00-3.00)	3.00 (3.00-4.00)

*Identified as a necessary competency for information systems workers.

TABLE 9, continued

Item #	Statement	Median (I-Q Range) Round 1 n=657	Median (I-Q Range) Round 2 n=475
Identify and use the following computer recording media:			
517	Floppy disks	4.00 (3.00-4.00)	2.00 (2.00-3.00)
518	Hard disks	4.00 (3.00-4.00)	2.00 (2.00-3.00)
*519	CD-ROM	3.00 (2.00-3.00)	4.00 (4.00-4.00)
*520	Cassettes	2.00 (2.00-3.00)	4.00 (4.00-4.00)
*521	Magnetic tape	3.00 (2.00-3.00)	3.00 (2.00-3.00)
522	Optical disks	3.00 (2.00-3.00)	2.00 (2.00-3.00)
Know the importance of the computers itemized below in the office environment:			
523	Mainframes	3.00 (3.00-4.00)	2.00 (2.00-3.00)
*524	Minicomputers	3.00 (3.00-4.00)	3.00 (2.00-3.00)
*525	Microcomputers	4.00 (3.00-4.00)	3.00 (3.00-4.00)
Identify the factors in the selection of:			
*526	storage systems	3.00 (3.00-4.00)	3.00 (3.00-4.00)
*527	retrieval systems	3.00 (3.00-4.00)	4.00 (3.00-4.00)
*528	Evaluate, set up, and maintain a records inventory program (which might include records transfer, records retention, and records destruction).	3.00 (2.00-4.00)	3.00 (3.00-4.00)
*529	Demonstrate hands-on operational knowledge of software packages.	3.00 (3.00-4.00)	3.00 (3.00-4.00)

*Identified as a necessary competency for information systems workers.

A STUDY TO IDENTIFY COMPETENCIES FOR INFORMATION SYSTEMS WORKERS
TABLE 9, continued

Item #	Statement	Median (I-Q Range) Round 1 n=657	Median (I-Q Range) Round 2 n=475
Specifically, the relative importance of the software packages itemized below:			
*530	Word processing	4.00 (3.00-4.00)	3.00 (3.00-3.00)
*531	Spreadsheet	4.00 (3.00-4.00)	3.00 (3.00-4.00)
*532	Database	4.00 (3.00-4.00)	4.00 (4.00-4.00)
*533	Graphics	3.00 (2.00-4.00)	4.00 (4.00-4.00)
*534	Desktop management	3.00 (2.00-3.00)	4.00 (3.00-4.00)
*535	Records management	3.00 (2.00-3.00)	3.00 (3.00-4.00)
*536	Inventory control	3.00 (2.00-3.00)	3.00 (3.00-3.00)
*537	Telecommunications	3.00 (2.00-4.00)	3.00 (3.00-3.00)
*538	Accounting	3.00 (2.00-3.00)	3.00 (2.00-3.00)
*539	Electronic mail system	3.00 (2.00-4.00)	3.00 (3.00-3.00)
*540	Integrated	3.00 (2.00-4.00)	3.00 (2.00-3.00)
Evaluate, recommend, and justify:			
*541	the most appropriate hardware for an office environment.	3.00 (3.00-4.00)	3.00 (3.00-4.00)
*542	the most appropriate software for an office environment.	3.00 (3.00-4.00)	3.00 (3.00-3.00)
*543	Evaluate appropriateness of preventive maintenance and service contracts for automated office hardware and software.	3.00 (2.00-4.00)	3.00 (3.00-4.00)
*544	Design the floor plan for hardware configuration in an office environment.	3.00 (2.00-3.00)	3.00 (3.00-4.00)
Coordinate the implementation of:			
*545	software	3.00 (3.00-4.00)	3.00 (3.00-3.00)
*546	hardware	3.00 (3.00-4.00)	3.00 (3.00-4.00)

*Identified as a necessary competency for information systems workers.

A STUDY TO IDENTIFY COMPETENCIES FOR INFORMATION SYSTEMS WORKERS

TABLE 9, continued

Item #	Statement	Median (I-Q Range) Round 1 n=657	Median (I-Q Range) Round 2 n=475
*547	Utilize batch, on-time, real time, time sharing, shared logic, or shared resource processing.	3.00 (2.00-3.00)	3.00 (3.00-4.00)
Recognize and request the appropriate service for:			
*548	hardware malfunctions.	3.00 (3.00-4.00)	3.00 (3.00-3.00)
*549	software malfunctions.	3.00 (3.00-4.00)	3.00 (3.00-4.00)
*550	Determine problems and complete equipment diagnostics through troubleshooting.	3.00 (2.00-4.00)	3.00 (3.00-4.00)
*551	Evaluate and compare software packages for hardware environments.	3.00 (3.00-4.00)	3.00 (3.00-3.00)
*552	Demonstrate an operational knowledge of electronic communications by developing and testing data communications.	3.00 (2.00-4.00)	3.00 (3.00-3.00)
Indicate the relative importance of electronic communications of:			
*553	Data	4.00 (3.00-4.00)	3.00 (3.00-3.00)
*554	Text	4.00 (3.00-4.00)	4.00 (4.00-4.00)
*555	Voice	3.00 (2.00-3.00)	4.00 (4.00-4.00)
*556	Graphics	3.00 (2.00-3.00)	3.00 (3.00-3.00)
*557	Networks	3.00 (3.00-4.00)	3.00 (3.00-3.00)
*558	Teleconferencing	3.00 (2.00-3.00)	3.00 (3.00-4.00)
*559	Electronic mail	3.00 (2.00-4.00)	3.00 (3.00-3.00)
*560	Identify and define needed features and functions of operations systems software.	3.00 (3.00-4.00)	3.00 (3.00-4.00)
*561	Identify and define needed features and functions of applications software.	3.00 (3.00-4.00)	3.00 (3.00-3.00)

*Identified as a necessary competency for information systems workers.

A STUDY TO IDENTIFY COMPETENCIES FOR INFORMATION SYSTEMS WORKERS

TABLE 9, continued

Item #	Statement	Median (I-Q Range) Round 1 n=657	Median (I-Q Range) Round 2 n=475
*562	Identify the legal aspects of an information system; e.g., information ownership, copyrights vs public domain, licensing.	3.00 (2.00-3.00)	3.00 (3.00-3.00)
Describe the need for:			
*563	security of data.	3.00 (3.00-4.00)	3.00 (3.00-3.00)
*564	security of facilities.	3.00 (3.00-4.00)	3.00 (3.00-4.00)
Exhibit research skills which demonstrate ability to:			
*565	locate vendors.	3.00 (2.00-3.00)	3.00 (3.00-4.00)
*566	locate documentation.	3.00 (3.00-4.00)	3.00 (3.00-3.00)
*567	locate new sources and new techniques for implementing, changing, and/or upgrading existing equipment.	3.00 (3.00-4.00)	3.00 (3.00-3.00)
*568	Identify ergonomic factors in the selection of equipment.	3.00 (2.00-3.00)	3.00 (3.00-3.00)
Define the strengths/weaknesses and similarities/differences of the following operating systems:			
*569	PC-DOS	3.00 (2.00-4.00)	3.00 (3.00-3.00)
*570	MS-DOS	3.00 (2.00-4.00)	3.00 (3.00-3.00)
*571	CP/M	2.00 (2.00-3.00)	3.00 (3.00-3.00)
572	MP/M	2.00 (1.50-3.00)	2.00 (2.00-3.00)
573	VM	2.00 (2.00-3.00)	2.00 (2.00-2.00)
574	MVS	2.00 (2.00-3.00)	2.00 (2.00-3.00)
575	VSE	2.00 (2.00-3.00)	2.00 (2.00-3.00)
576	DOS	3.00 (2.00-4.00)	2.00 (2.00-2.00)
*577	Unix	3.00 (2.00-3.00)	3.00 (3.00-3.00)
*578	Xenix	2.00 (2.00-3.00)	3.00 (2.00-3.00)

*Identified as a necessary competency for information systems workers.

A STUDY TO IDENTIFY COMPETENCIES FOR INFORMATION SYSTEMS WORKERS
TABLE 9, continued

Item #	Statement	Median (I-Q Range) Round 1 n=657	Median (I-Q Range) Round 2 n=475
	Define the similarities and the differences in standard codes for storing and transferring information:		
579	ASCII	3.00 (2.00-4.00)	2.00 (2.00-3.00)
*580	EBCDIC	3.00 (2.00-3.00)	3.00 (3.00-3.00)
*581	DIF	2.00 (2.00-3.00)	3.00 (2.00-3.00)
582	DCA	2.00 (2.00-3.00)	2.00 (2.00-3.00)
	Analyze methodologies, protocols, and systems for transmission of:		
583	data	3.00 (2.00-4.00)	2.00 (2.00-3.00)
*584	text	3.00 (2.00-4.00)	3.00 (3.00-4.00)
*585	voice	3.00 (2.00-3.00)	3.00 (3.00-4.00)
*586	graphics	3.00 (2.00-3.00)	3.00 (2.00-3.00)
	Demonstrate a knowledge of the following communications terminology in information systems:		
*587	networks (LANs, WANs)	3.00 (2.50-4.00)	3.00 (3.00-3.00)
*588	voice (synthesis, recognition)	3.00 (2.00-3.50)	3.00 (3.00-4.00)
*589	electronic mail	3.00 (3.00-4.00)	3.00 (3.00-3.00)
*590	teleconferencing	3.00 (2.00-3.00)	3.00 (3.00-3.25)
*591	compatibility	4.00 (3.00-4.00)	3.00 (3.00-3.00)
*592	connectivity	3.00 (2.00-4.00)	3.00 (3.00-4.00)
*593	conversion	3.00 (3.00-4.00)	3.00 (3.00-4.00)
*594	protocols	3.00 (3.00-4.00)	3.00 (3.00-3.00)
*595	expandability	3.00 (3.00-4.00)	3.00 (3.00-3.00)
*596	interface	3.00 (3.00-4.00)	3.00 (3.00-3.00)
*597	interactive	3.00 (3.00-4.00)	3.00 (3.00-4.00)
*598	editability	3.00 (2.00-3.00)	3.00 (3.00-3.00)
*599	processability	3.00 (2.00-3.00)	3.00 (3.00-3.00)

*Identified as a necessary competency for information systems workers.

A STUDY TO IDENTIFY COMPETENCIES FOR INFORMATION SYSTEMS WORKERS
TABLE 9, continued

Item #	Statement	Median (I-Q Range) Round 1 n=657	Median (I-Q Rang Round 2 n=475
*600	Develop, use, and maintain a disaster recovery plan.	3.00 (3.00-4.00)	3.00 (3.00-3.00)
Care for and handle:			
*601	computer software.	4.00 (3.00-4.00)	3.00 (3.00-4.00)
*602	computer hardware.	4.00 (3.00-4.00)	4.00 (4.00-4.00)
*603	computer peripherals.	3.00 (3.00-4.00)	4.00 (4.00-4.00)
*604	computer media.	3.00 (3.00-4.00)	4.00 (3.00-4.00)
Indicate your opinion of the importance of each of the methodologies itemized below to the person an Information Systems occupation:			
*605	Systems analysis	3.00 (3.00-4.00)	3.00 (3.00-4.00)
*606	Flow charting	3.00 (2.00-3.00)	3.00 (3.00-4.00)
*607	Project management	3.00 (3.00-4.00)	3.00 (2.00-3.00)
*608	Systems design	3.00 (2.00-4.00)	3.00 (3.00-3.00)
*609	Software installation	3.00 (3.00-4.00)	3.00 (3.00-3.00)
*610	Hardware installation	3.00 (2.00-4.00)	3.00 (3.00-3.00)
*611	Modify or change the defaults in a software applications package.	3.00 (3.00-4.00)	3.00 (3.00-3.00)
*612	Update technical instructions or procedures for equipment use based on systems changes and/or upgrading.	3.00 (3.00-4.00)	3.00 (3.00-4.00)
*613	Interface with all levels of employees in the office to enhance information systems.	3.00 (3.00-4.00)	3.00 (3.00-3.00)
*614	Analyze work flow in the office to determine the best use of equipment.	3.00 (3.00-4.00)	3.00 (3.00-4.00)

*Identified as a necessary competency for information systems workers.

A STUDY TO IDENTIFY COMPETENCIES FOR INFORMATION SYSTEMS WORKERS

TABLE 9, concluded

Item #	Statement	Median (I-Q Range) Round 1 n=657	Median (I-Q Range) Round 2 n=475
*615	Conduct feasibility studies for the automated office.	3.00 (2.00-4.00)	3.00 (3.00-4.00)
Set up demonstrations and trial usage for:			
*616	hardware	3.00 (3.00-4.00)	3.00 (3.00-3.00)
*617	software	3.00 (3.00-4.00)	3.00 (3.00-3.00)
*618	peripherals	3.00 (3.00-4.00)	3.00 (3.00-3.00)
*619	Upload and download between micro and mainframe.	3.00 (2.00-4.00)	3.00 (3.00-3.00)
*620	Desktop publishing		3.00 (3.00-3.00)
*621	Network management		3.00 (3.00-3.00)
*622	OS/2		3.00 (3.00-3.00)
*623	VMS		3.00 (2.00-3.00)
624	ISO Standards		2.00 (2.00-3.00)
625	Expert Systems/AI		2.00 (2.00-3.00)

*Identified as a necessary competency for information systems workers.

modems, and copiers; handling and care of recording media, such as CD-ROM and magnetic tapes; in general, hands on operational knowledge of word processing, spreadsheet, database, graphics, desktop management, records management, inventory control, telecommunications, desktop publishing, accounting, electronic mail, and integrated software packages, including modifying or changing the defaults; upload and download between a microcomputer and a mainframe; and utilize batch, on-time, real time, time sharing, shared logic, or shared resource processing.

2) Decision Making: selection of storage and retrieval systems; evaluate, compare, recommend, justify, and coordinate the selection, installation, and implementation of appropriate hardware, software, preventive maintenance, and service contracts; arrange for appropriate service for hardware and software after completing diagnostics troubleshooting.

3) Research Skills: locate vendors, documentation, and new sources and new techniques for implementing, changing, and/or upgrading existing equipment; conduct feasibility studies; set up demonstrations and trial usage for hardware, software, and peripherals.

4) Records Management: set up and maintain a records inventory program, including records transfer, records retention, and records destruction.

5) Critical Thinking: design a floor plan for hardware configurations, taking into account ergonomic factors and work flow patterns; develop and test data communications; identify and define features and functions of operations systems software and applications software, taking into account the strengths/weaknesses and similarities/ differences of these specific operating systems: PC-DOS, MS-DOS, OS/2, VMS, and Unix; know the legal ramifications of information ownership, copyrights, public domain, licensing; describe the need for security of data and facilities; identify the importance of systems analysis, flow charting, project management, and systems design for information systems.

6) Telecommunications: indicate the importance of electronic communications of data, text, voice, graphics, networks, teleconferencing, and electronic mail through analyzing methodologies, protocols, network management, and systems for specific transmission of text, voice, and graphics; specifically define the similarities and differences in storing and transferring information with EBCDIC; demonstrate a knowledge of these specific communications terminology: networks (LANs, WANs), voice

(synthesis, recognition), electronic mail, teleconferencing, compatibility, connectivity, conversion, protocols, expandability, interface, interactive, editability, and processability; develop and use a disaster recovery plan.

7) Communications: update technical instructions or procedures based on systems changes and/or upgrading.

8) Interpersonal Skills: interface with all levels of employees in the office to enhance information systems.

The remaining 16 items in this skill area were designated as "Somewhat Important" competencies for information systems workers by respondents. These items were clustered in the areas of technical knowledge related to equipment manipulation or telecommunications.

Of the 126 competency statements, 74 (58.73%) reached group consensus through evidence of the smaller interquartile range from Round One to Round Two, illustrating stronger agreement among respondents. These items fell into the following clusters:

1) Equipment Manipulation: "touch" proficiency of computer keyboard, including alphabetic, numeric, and function keys, as well as the 10-key pad; operation of input devices, such as OCRs, communicating word processors, and voice processors; operation and care of hardware and peripheral devices, such as modems and copiers; handling and care of recording media, such as CD-ROM and cassettes; in general, hands on operational knowledge of database, graphics, desktop management, inventory control, electronic mail, and integrated software packages, including modifying or changing the defaults; and uploading and downloading between a microcomputer and a mainframe.

2) Decision Making: evaluate, compare, recommend, justify, and coordinate the installation of appropriate hardware, software, preventive maintenance, and service contracts; arrange for appropriate service for hardware, and complete diagnostic troubleshooting.

3) Research Skills: locate documentation and new

sources and new techniques for implementing, changing, and/or upgrading existing equipment; conduct feasibility studies; and set up demonstrations and trial usage for hardware, software, and peripherals.

4) Records Management: set up and maintain a records inventory program, including records transfer, records retention, and records destruction.

5) Critical Thinking: take into account ergonomic factors; develop and test data communications; identify and define features and functions of applications software, taking into account the strengths/weaknesses and similarities/differences of these specific operating systems: strong agreement as essential: PC-DOS, MS-DOS, CP/M, and Unix; strong agreement as less important: MP/M, VM, AND DOS; know the legal ramifications of information ownership, copyrights, public domain, licensing; describe the need for security of data; identify the importance of systems design for information systems.

6) Telecommunications: indicate the importance of electronic communications of data, text, voice, graphics, networks, and electronic mail through analyzing methodologies, protocols, network management, and systems for specific transmission of text (essential) and data (less important); specifically define the similarities and differences in storing and transferring information with EBCDIC (essential) and ASCII (less important); demonstrate a knowledge of these specific communications terminology: networks (LANs, WANs), voice (synthesis, recognition), electronic mail, teleconferencing, compatibility, protocols, expandability, interface, editability, and processability; develop and use a disaster recovery plan.

7) Interpersonal Skills: interface with all levels of employees in the office to enhance information systems.

The wide variety of technological skills which were perceived to be necessary competencies for information systems workers was emphasized by the respondents, as their comments point out:

> Specific hardware and software savvy will vary depending on what is available in each specific situation; in my opinion general technological skills are essential.

> This field is changing so rapidly anyone entering it must be flexible, eager to learn something new and willing to spend the time to stay on top of developments. They do not need to know specific programs as much as they need to know how to use at least one of each of the different types--spreadsheet, wp, database, etc. They can always make the change to their employer's particular vendor.
>
> I see telecommunications as becoming much more important in the near future with the concomitant responsibility to be able to set up communications between dissimilar equipment.
>
> Please send us the person with human relations and communications skills and we'll train them on the equipment...
>
> A systems designer would be expected to have different skills from an operator or a supervisor...
>
> After completing this section of the survey, I am overwhelmed at the amount of technical skills a person in this kind of job must have. I don't see any way to get around it. People entering this field will never stop learning. In fact, we have to "run to keep up".

During the second round of the questionnaire, two additional sets of questions were added due to input from respondents. These two sections are PREREQUISITE SKILLS and LEVEL OF EMPLOYEE. These sections are discussed below.

PREREQUISITE SKILLS. For purposes of this study, PREREQUISITE SKILLS were considered to be those which information systems workers must have before entering an information systems occupation. In Table 10 is displayed the data produced in this section.

Four of the five items in this category received "Very Important" ratings. These four items had to do with

A STUDY TO IDENTIFY COMPETENCIES FOR INFORMATION SYSTEMS WORKERS
TABLE 10
PREREQUISITE SKILLS
Responses from Delphi Panel

Item #	Statement	Median (I-Q Range) Round 2 n=475
What is your perception of the importance of the following prerequisite skills for the person entering an Information Systems occupation?		
*1	Office practices and procedures.	3.00 (3.00-4.00)
*2	Information skills which include: --what data items are essential to the business; --what data items are essential in each of the reports used to manage the business; --who "owns" each data item; --who "uses" each data item; --what "derived" data items are formed from basic data items.	3.00 (3.00-4.00)
*3	BASIC programming skills.	3.00 (3.00-4.00)
4	State-of-the-art technology.	2.00 (2.00-3.00)
*5	Knowledge of the information processing cycle: input, output, processing, storage/retrieval, and distribution.	3.00 (2.00-3.00)

*Identified as a necessary competency for information systems workers.

office practices and procedures; information ownership and usage, as well as which data are essential to the business and its business reports; BASIC programming; and knowledge of the information cycle (input, output, processing, storage/ retrieval, and distribution). One item, state-of-art-technology, received a "Somewhat Important" rating.

Comments from respondents in this section emphasized three points, as follows:

> Business data usage, ownership, etc. will be picked up as a person gains familiarity with a particular company; these may be hard to acquire before going on the job.
>
> Technology is changing at such a rapid pace that it is not necessary for a person to have state-of-the-art knowledge to enter the profession, only willingness to learn and keep up with changes.
>
> The important thing for information systems workers to know is that most of their education will be obtained after they 'land' that first position.

LEVEL OF EMPLOYEE. These data have to do with the level of employee for which the responses were intended. Although respondents were asked to check the **one** box which most nearly described their choice, a number of respondents checked more than one box. Hence, totals in Table 11 add up to more than 100%. In Table 11 is displayed the data generated by the second category of questions added for consideration and analysis during Round Two by the individuals in the study population.

The largest percentage of panelists indicated that

A STUDY TO IDENTIFY COMPETENCIES FOR INFORMATION SYSTEMS WORKERS
TABLE 11

LEVEL OF EMPLOYEE
Responses from Delphi Panel

Item #	Statement	No. of Responses	Percentages
As you completed this survey, what level of employee did you have in mind? (Number of possible responses (475)			
1	Entry-level administrative support?	38 responses	8.00%
2	Mid-level administrative support?	34 responses	7.16%
3	Top-level administrative support?	107 responses	22.52%
4	Technical?	72 responses	15.16%
5	Professional?	71 responses	14.94%
6	First-line supervisor?	92 responses	19.37%
7	Managerial?	75 responses	15.79%
		489 responses	102.94%*

*Total is more than 100% due to more than one response per participant.

they were considering an information systems worker in a top-level administrative support position (22.52%) as they were completing the survey. The next level of employee considered was the first-line supervisor (19.37%). Responses for the next three levels were very close in consideration: managerial (15.79%), technical (15.16%), and professional (14.94%). Entry-level (8.00%) and mid-level (7.16%) administrative support positions were the categories considered least by the respondents.

In general, respondents indicated that they would have preferred that this question come at the beginning of the survey or in the first round of the questionnaire. Many expressed difficulty in choosing only one category; a specific comment spoke to the fact that

> many of the statements pertain to administrative personnel, some to management, and some to supervisory personnel. For this reason, I had difficulty only selecting one category.

Summary of Delphi Analysis. This chapter has contained a description and analysis of the data collected in this study through the use of the Delphi technique. After Round One, the data from the questionnaire yielded a median and interquartile range for each item and suggestions for additions and deletions, as well as comments by the participants. After Round Two, the final medians and interquartile ranges were obtained for each item.

Of the 318 competency statements in this study for which the medians and interquartile ranges were obtained during both rounds, 286 items (88.94%) were rated "Essential" or "Very Important", hence, necessary competencies for information systems workers, by the respondents. Specifically, 63 items (19.81%) received an "Essential" rating and 223 items (70.12%) were rated "Very Important". Three categories, COMMUNICATIONS SKILLS, INTERPERSONAL SKILLS, and TECHNOLOGICAL SKILLS, accounted for 160 (55.94%) of the 286 essential competencies.

Group consensus, as evidenced by the smaller interquartile range from Round One to Round Two, was achieved on 162 of the 318 items (50.94%). The greatest consensus was evident in three skill areas: COMMUNICATIONS SKILLS, INTERPERSONAL SKILLS, and TECHNOLOGICAL SKILLS. These three areas accounted for consensus on 123 (75.92%) of the 162 items.

It was anticipated that a great number of the components and competency statements would be considered necessary skills for information systems workers because of the use in this study of two methodologies which rely heavily on experts in the field of study. For this reason, one additional analytical step was taken in order to provide clearer distinctions among the clusters of items. The next section of this chapter deals with the Analysis of Distinction.

ANALYSIS OF DISTINCTION

The "pure" analysis of data in this study has presented the medians and interquartile ranges for the listings of components and competencies. This analysis is supported in the literature when using data collected through the Delphi technique. However, differences which are usually found in studies such as this one which seek to explore and describe a problem may be lacking. In Tables 12 and 13 are presented a rank ordering of means of the 8 components and 312 competency (task) statements used in the Information Systems Occupational Competencies Questionnaire to collect the data in Round Two.

For purposes of this study, components or competency (task) statements with a mean rating of 3.51 or above were considered "Essential" competencies; statements with a mean rating of 2.51-3.50 were considered "Very Important" competencies; and statements with a mean rating of 2.50 or below were considered to be "Somewhat Important" competencies.

Table 12 presents the rank ordering of the basic components, illustrating that INTERPERSONAL SKILLS and GENERAL EDUCATION SKILLS were ranked as "Essential". This supports the finding in the Delphi analysis that INTERPERSONAL SKILLS and GENERAL EDUCATION SKILLS were considered essential skills for information systems workers. The other 6 broad skill areas, MANAGEMENT SKILLS,

A STUDY TO IDENTIFY COMPETENCIES
FOR INFORMATION SYSTEMS WORKERS

TABLE 12

ANALYSIS OF DISTINCTION
Mean Ranking of Basic Components
(Skill Areas)

Item #	Statement	Mean (SD) n=475
COMPONENTS RATED AS ESSENTIAL:		
30	INTERPERSONAL SKILLS	3.83 (.38)
70	GENERAL EDUCATION SKILLS	3.68 (.54)
COMPONENTS RATED AS VERY IMPORTANT:		
40	MANAGEMENT/PROBLEM SOLVING/ INTRAPRENEURIAL SKILLS	3.36 (.53)
20	COMMUNICATIONS SKILLS	3.27 (.57)
50	TECHNOLOGICAL SKILLS	3.17 (.60)
10	BUSINESS SKILLS	3.00 (.00)

PROBLEM SOLVING SKILLS, INTRAPRENEURIAL SKILLS, COMMUNICATIONS SKILLS, TECHNOLOGICAL SKILLS, and BUSINESS SKILLS were ranked as "Very Important".

Table 13 presents the rank ordering of the competency statements. Of the 312 competency statements, 56 (17.95%) were ranked as "Essential" skills. Of the 56 essential competencies, 23 (41.07%) were in the INTERPERSONAL SKILLS area; 14 (25%) were in the COMMUNICATIONS SKILLS area; and 13 (23.21%) were in the TECHNOLOGICAL SKILLS area. These three categories accounted for 50 (89.28%) of the 56 competencies which were rank ordered as "Essential". Four other skills areas, BUSINESS SKILLS, MANAGEMENT SKILLS, PROBLEM SOLVING SKILLS, and INTRAPRENEURIAL SKILLS, accounted for the remaining essential statements. These statements were identified as those regarding risk, human relations, ability to set goals or plans, cost/benefit justification, and problem situation analysis.

Of the 312 competency statements which attained means of 2.51-3.50 in Table 13, 226 (72.43%) were ranked as "Very Important" skills, as follows: 14 (6.19%) of the 226 statements were in the BUSINESS SKILLS category; 36 (15.93%) of the 226 statements were in the COMMUNICATIONS SKILLS category; 27 (11.95%) of the 226 statements were in the INTERPERSONAL SKILLS category; 24 (10.62%) of the 226 statements were in the MANAGEMENT SKILLS area; 10 (4.42%) of the 226 statements were in the PROBLEM SOLVING SKILLS

A STUDY TO IDENTIFY COMPETENCIES FOR INFORMATION SYSTEMS WORKERS

TABLE 13

ANALYSIS OF DISTINCTION

Mean Ranking of Competencies (Tasks)

Item #	Statement	Mean (SD) n=475
COMPETENCIES RATED AS ESSENTIAL:		
311	Concept of self	3.94 (.22)
204	Questioning	3.93 (.26)
310	Time management	3.93 (.25)
302	Negotiation	3.93 (.25)
220	Importance of channels	3.92 (.26)
341	Training/teaching ability	3.88 (.32)
331	Job skills	3.86 (.34)
322	Initiative/self-starter	3.86 (.34)
316	Setting and meeting goals	3.86 (.36)
317	Personal development plans/goals	3.86 (.35)
202	Listening	3.86 (.38)
340	Adventuresome (willing to learn new things)	3.84 (.37)
532	Software package: database	3.84 (.43)
328	Creativity	3.83 (.37)
315	Getting along with people	3.82 (.39)
332	Enthusiasm	3.82 (.44)
519	Identify and use: CD-ROM	3.80 (.49)
438	Analyze one's personal risk boundaries in order to determine the amount of risk one is willing to take to get the job done.	3.79 (.43)
555	Electronic communication of: voice	3.79 (.46)
401	Demonstrate the ability to set goals or plans for the information systems functions in an office.	3.79 (.42)
554	Electronic communication of: text	3.79 (.44)
333	Risk taker	3.79 (.43)
427	Analyze the situation to get the basic facts and feelings of the situation.	3.79 (.44)
327	Leadership ability	3.79 (.41)
421	Analyze the cost/benefit justification of the information systems in an office.	3.78 (.44)
512	Identify and operate: modems	3.77 (.50)
508	Identify and operate: Communicating word processors	3.77 (.49)

Item #	Statement	Mean (SD) n=475
346	Research skills	3.77 (.43)
325	Interest in job	3.77 (.42)
520	Identify and use: cassettes	3.77 (.52)
312	Loyalty	3.76 (.46)
113	Develop and maintain good working relationships with vendors, distributors, and outside consultants.	3.75 (.47)
205	Grammar	3.75 (.47)
533	Software package: graphics	3.75 (.51)
306	Personal appearance	3.75 (.45)
207	Telephone techniques	3.75 (.51)
602	Care for and handle hardware.	3.74 (.50)
321	Community involvement (service)	3.72 (.47)
206	Punctuation	3.72 (.48)
603	Care for and handle peripherals.	3.72 (.52)
437	Analyze the boundaries of risk which an organization is willing to set for individuals.	3.71 (.50)
212	Revise memos.	3.71 (.54)
215	Compose memos.	3.70 (.55)
213	Revise reports.	3.69 (.56)
338	Follow-up and follow-through	3.68 (.49)
210	Keyboard/format reports.	3.67 (.57)
214	Compose letters.	3.66 (.59)
527	Identify the factors in the selection of retrieval systems.	3.66 (.54)
211	Revise letters.	3.66 (.58)
208	Keyboard/format letters.	3.64 (.58)
503	"Touch" proficiency of symbolic keys.	3.64 (.63)
318	Problem solving	3.56 (.50)
237	Telecommunications systems: PABX	3.54 (.66)
534	Software packages: desktop management	3.53 (.58)
326	Knowledge of job	3.52 (.52)
342	Helpfulness/cooperative	3.51 (.54)

COMPETENCIES RATED AS VERY IMPORTANT:

344	Flexibility	3.50 (.51)
320	Professionalism (including ethics, morals, values)	3.48 (.52)
400	Define the functions of management.	3.47 (.50)
100	Work within and support the organization's ethical structure.	3.47 (.66)

Item #	Statement	Mean (SD) n=475
604	Care for and handle media.	3.46 (.58)
324	Planning and organizing	3.45 (.53)
339	Sense of responsibility	3.45 (.51)
418	Develop and maintain good working relationships with vendors and distributors outside of the office.	3.45 (.53)
334	"Extra" efforts	3.44 (.54)
347	Cost consciousness	3.44 (.53)
314	Pride in self, work, department, and company	3.43 (.55)
605	Methodologies: systems analysis	3.43 (.59)
313	Sense of urgency/meeting deadlines	3.41 (.53)
300	Communications	3.41 (.72)
337	Self-confidence	3.39 (.52)
245	Dictate memos.	3.39 (.57)
201	Nonverbal	3.38 (.58)
435	Communicate the solution to the problem to the people involved, taking into account the factors of verbal and nonverbal communication.	3.38 (.56)
614	Analyze work flow in the office to determine the best use of equipment.	3.37 (.55)
209	Keyboard/format memos.	3.35 (.63)
436	Involve the right people in the analysis, implementation, and evaluation of the problem and its solution.	3.35 (.53)
564	Describe the need for security of facilities.	3.34 (.56)
203	Written	3.34 (.60)
434	Be sensitive to the areas in an office where problems may arise; (e.g., human, economic, systems).	3.34 (.51)
307	Neatness of work, work area	3.34 (.57)
350*	Honest, trustworthy	3.34 (.52)
525	Importance of microcomputers.	3.33 (.58)
308	Dependability	3.32 (.56)
526	Identify factors in selection of storage systems.	3.32 (.57)
429	Collect relevant/irrelevant data regarding the problem and issues.	3.32 (.52)
448	Employ conflict resolution techniques in order to bring about positive outcomes of conflict.	3.32 (.50)
432	Implement the solution.	3.32 (.52)
Prel*	Office practices and procedures.	3.31 (.56)
345	Respect for work area and equipment	3.31 (.53)

Item #	Statement	Mean (SD) n=475
544	Design the floor plan for hardware configuration in an office environment.	3.31 (.56)
550	Determine problems and complete equipment diagnostics through troubleshooting.	3.30 (.50)
243	Telecommunications systems: communicating word/information processors (dedicated, PC's, host)	3.30 (.67)
336	Team player	3.30 (.55)
549	Recognize and request appropriate service for software malfunctions.	3.30 (.51)
216	Compose reports.	3.29 (.62)
217	Receive and transmit messages from traditional sources; (e.g., telephone, face-to-face, mail systems, etc.).	3.29 (.61)
102	Identify and work within the basic procedures and systems in the office; (e.g., accounting, budgeting, inventory, payroll, etc.).	3.28 (.62)
592	Communications terminology: connectivity.	3.28 (.52)
430	Develop and analyze alternate solutions to the problem.	3.28 (.53)
406	Determine the materials needed for information systems functions in an office (e.g., hardware, software, media, peripherals, etc.).	3.27 (.56)
218	Listen actively when given directions, asking for clarification when unsure.	3.27 (.63)
110	Apply statistical methods to analyze current economic conditions, database information, and market research.	3.27 (.53)
408	Create, revise, and disseminate the policies, procedures, and methods to be used in the information systems functions in an office.	3.27 (.53)
412	Research, evaluate, and make recommendations for setting up/ maintaining/upgrading: media.	3.27 (.49)
543	Evaluate appropriateness of preventive maintenance and service contracts for automated office hardware and software.	3.27 (.55)

Item #	Statement	Mean (SD) n=475
425	Define and describe the problem.	3.26 (.57)
419	Develop and maintain good working relationships with persons at all levels in the office.	3.26 (.57)
601	Care for and handle software.	3.26 (.62)
560	Identify and define needed features and functions of operations systems software.	3.26 (.64)
433	Create the kind of environment where problems are seen as challenges, not as roadblocks and stumbling stones.	3.25 (.48)
115	Become familiar with business terminology as it applies to any given business environment.	3.25 (.57)
443	Determine the extent to which an individual is encouraged by an organization to develop himself/herself.	3.25 (.55)
565	Exhibit research skills to locate vendors.	3.24 (.56)
615	Conduct feasibility studies for the automated office.	3.24 (.52)
415	Research, evaluate, and make recommendations for setting up/ maintaining/upgrading lease/purchase agreements.	3.23 (.53)
303	Persuasion	3.23 (.54)
330	Attendance (on time, record of)	3.23 (.57)
319	Decision making/judgment	3.23 (.51)
546	Coordinate the implementation of hardware.	3.23 (.53)
502	"Touch" proficiency of numeric keys.	3.22 (.63)
411	Research, evaluate, and make recommendations for setting up/ maintaining/upgrading peripherals.	3.22 (.49)
528	Evaluate, set up, and maintain a records inventory program (which might include records transfer, records retention, and records destruction).	3.22 (.52)
422	Maintain constant evaluation of equipment and network needs at the end-user level.	3.22 (.51)
558	Electronic communications of: teleconferencing.	3.22 (.59)
529	Demonstrate hands-on operational knowledge of software packages.	3.22 (.52)

Item #	Statement	Mean (SD) n=475
219	Define concepts in telecommunications.	3.22 (.57)
547	Utilize batch, on-time, real time, time sharing, shared logic, or shared resource processing.	3.21 (.52)
447	Coordinate, set up, and conduct training for all levels of employees within an organization.	3.21 (.56)
403	Demonstrate the ability to control the information systems functions in an office.	3.21 (.49)
588	Communications terminology: voice (synthesis, recognition)	3.21 (.51)
404	Demonstrate the ability to lead or direct the people to attain the goals for information systems in an office.	3.20 (.51)
597	Communications terminology: interactive	3.20 (.53)
105	Identify the main characteristics of the various forms of organization (e.g., formal, line-staff, matrix, information, functional, line, etc.).	3.20 (.59)
304	Motivation	3.20 (.59)
584	Transmission of: text	3.20 (.58)
301	Delegation	3.19 (.62)
562	Identify the legal aspects of an information system; e.g., information ownership, copyrights vs public domain, licensing.	3.19 (.48)
413	Research, evaluate, and make recommendations for setting up/ maintaining/upgrading training.	3.19 (.49)
593	Communications terminology: conversion	3.19 (.53)
585	Transmission of: voice	3.19 (.59)
114	Develop, revise, disseminate, and explain to co-workers information systems procedures and policies.	3.18 (.61)
101	Develop a set of personal ethics.	3.18 (.57)
305	Sense of humor	3.17 (.59)
606	Methodologies: Flow charting	3.17 (.58)
103	Describe the importance of individuals within the office.	3.16 (.56)
535	Software packages: records management	3.16 (.61)

Item #	Statement	Mean (SD) n=475
613	Interface with all levels of employees in the office to enhance information systems.	3.16 (.51)
410	Research, evaluate, and make recommendations for setting up/ maintaining/upgrading software.	3.16 (.53)
431	Choose from the options and compare defined goal with the possible ways of solving problem.	3.16 (.48)
531	Software packages: spreadsheet	3.16 (.58)
596	Communications terminology: interface	3.16 (.52)
594	Communications terminology: protocols	3.15 (.52)
612	Update technical instructions or procedures for equipment use based on systems changes and/or upgrading.	3.15 (.59)
541	Evaluate, recommend, and justify the most appropriate hardware for an office environment.	3.15 (.67)
570	Operating systems: MS-DOS	3.15 (.57)
514	Identify and operate peripherals: copiers.	3.15 (.65)
567	Exhibit research skills to locate new sources and new techniques for implementing, changing, and/or upgrading existing equipment.	3.15 (.50)
260*	Networking	3.15 (.64)
343	Knowledge of and adherence to company policies and procedures	3.14 (.55)
329	Attitude	3.14 (.56)
510	Identify and operate peripherals: printers.	3.14 (.61)
571	Operating systems: CP/M	3.14 (.58)
405	Determine the manpower needs for information systems in an office.	3.14 (.51)
252	Design, organize data for, and create visual aids for use in presentations.	3.14 (.60)
552	Demonstrate an operational knowledge of electronic communications by developing and testing data communications.	3.13 (.52)
407	Prepare a budget for the elements of the information systems functions in an office.	3.13 (.54)
590	Communications terminology: teleconferencing	3.13 (.60)

Item #	Statement	Mean (SD) n=475
420	Analyze the productivity and effectiveness of use and design of the information systems.	3.13 (.59)
610	Methodologies: hardware installation	3.13 (.57)
200	Verbal	3.12 (.57)
504	"Touch" proficiency: function keys	3.12 (.64)
424	Develop a marketing presentation package to sell to upper management.	3.12 (.51)
Pre2*	Information skills	3.12 (.67)
618	Set up demonstrations and trial usage for: peripherals.	3.12 (.50)
309	Reliability	3.11 (.63)
599	Communications terminology: processability	3.11 (.51)
428	Break down the problem into the essential elements and issues and clarify goals concerning the problem situation.	3.11 (.48)
500	Demonstrate "touch" proficiency in computer keyboard operation.	3.11 (.51)
423	Promote the information systems functions to all levels of the organization.	3.11 (.53)
561	Identify and define needed features and functions of applications software.	3.11 (.49)
617	Set up demonstrations and trial usage for software.	3.10 (.51)
568	Identify ergonomic factors in the selection of equipment.	3.10 (.49)
598	Communications terminology: editability	3.10 (.50)
108	Analyze business organizational structure for the best methods of achieving goals and productivity.	3.10 (.61)
608	Methodologies: systems design	3.09 (.54)
255	Explain the importance of the different kinds of nonverbal communication in the messages transmitted and received.	3.09 (.70)
501	"Touch" proficiency: alphabetic keys	3.09 (.50)
539	Software packages: electronic mail systems	3.09 (.62)

Item #	Statement	Mean (SD) n=475
595	Communications terminology: expandability	3.09 (.55)
542	Evaluate, recommend, and justify the most appropriate software for an office environment.	3.09 (.60)
244	Dictate letters.	3.08 (.71)
557	Electronic communications: networks	3.08 (.60)
349	Productivity	3.08 (.48)
409	Research, evaluate, and make recommendations for setting up/ maintaining/upgrading hardware.	3.08 (.60)
530	Software packages: word processing	3.08 (.59)
414	Research, evaluate, and make recommendations for setting up/ maintaining/upgrading maintenance/service contracts.	3.07 (.50)
620*	Desktop publishing	3.07 (.59)
251	Develop and prepare visual aids for use in presentations.	3.07 (.59)
551	Evaluate and compare software packages for hardware environments.	3.07 (.59)
506	Identify and operate input elements: keyboards.	3.07 (.65)
600	Develop, use, and maintain a disaster recovery plan.	3.07 (.51)
450	Utilize negotiating skills in the office.	3.07 (.50)
Pre3*	BASIC programming skills.	3.07 (.73)
619	Upload and download between micro and mainframe.	3.06 (.51)
451	Utilize persuasion skills in the office.	3.06 (.47)
442	Outline the procedures and components of strategic planning.	3.06 (.52)
516	Identify and operate peripherals: plotters.	3.05 (.75)
580	Standard codes for storing and transferring information: EBCDIC	3.05 (.67)
441	Be aware of the effect of change on others in the organization.	3.04 (.53)
446	Given a problem, use acquired knowledge to demonstrate the ability to analyze and evaluate a situation and present a workable solution in the best interest of the organization.	3.04 (.51)
569	Operating systems: PC-DOS	3.04 (.54)

Item #	Statement	Mean (SD) n=475
416	Be sensitive to the morale of the individuals in the office.	3.04 (.56)
616	Set up demonstrations and trial usage for hardware.	3.03 (.55)
611	Modify or change the defaults in a software applications package.	3.03 (.59)
609	Methodologies: software installation	3.03 (.57)
622*	OS/2	3.02 (.63)
440	Determine the extent to which the individual is willing to accept or reject change within an office.	3.02 (.50)
577	Operating systems: Unix	3.02 (.64)
537	Software packages: telecommunications	3.01 (.61)
566	Research skills to locate documentation.	3.00 (.53)
621*	Network management	3.00 (.62)
449	Demonstrate knowledge of feedback techniques in resolving conflict.	3.00 (.64)
256	Explain how formal (upward, downward) communication networks are used in the office.	2.99 (.58)
240	Telecommunications systems: TWX	2.98 (.73)
348	Maturity	2.98 (.55)
402	Demonstrate the ability to organize the information systems functions in an office.	2.97 (.56)
556	Electronic communications: graphics	2.97 (.65)
548	Recognize and request appropriate service for hardware malfunctions.	2.96 (.53)
417	Monitor the productivity of the information systems functions in an office.	2.96 (.60)
250	Set up, revise, and disseminate operating guidelines for software.	2.95 (.59)
509	Identify and operate input elements: voice processors	2.95 (.65)
445	Take advantage of opportunities to develop one's own capabilities on one's own time.	2.94 (.50)
536	Software packages: inventory control	2.94 (.60)

Item #	Statement	Mean (SD) n=475
112	Develop and maintain good working relationships with persons inside the organization.	2.93 (.60)
444	Determine the willingness of an organization to develop its human resources (e.g., the use of on-the-job and off-the-job professional development opportunities	2.93 (.54)
109	Work within the organizational structure to get the job done.	2.93 (.58)
507	Identify and operate the input elements of computers: OCRs	2.93 (.70)
335	Acceptance of criticism	2.90 (.61)
426	Explain how productivity may be dependent on adequate problem solving in the office.	2.89 (.62)
587	Communications terminology: networks (LANs, WANs)	2.89 (.60)
505	"Touch" proficiency: 10-key pad	2.89 (.62)
439	Define the climate for change in an office environment (e.g., the expectations for, encouragement of, and the willingness of an organization to effect change in itself and in individuals).	2.89 (.54)
563	Describe the need for security of data.	2.89 (.63)
231	Telecommunications concepts, terminology, and media: baseband	2.88 (.65)
221	Telecommunications concepts, terminology, and media: lines	2.87 (.58)
553	Electronic communications: data	2.86 (.59)
559	Electronic communications: electronic mail	2.86 (.60)
Pre5*	Knowledge of the information processing cycle: input, output, processing, storage/retrieval, and distribution.	2.86 (.72)
589	Communications terminology: electronic mail	2.86 (.60)
591	Communications terminology: compatibility	2.85 (.60)
257	Explain how informal (lateral) communication networks are used in the office.	2.84 (.63)

Item #	Statement	Mean (SD) n=475
254	Identify the major barriers to communication that a person may encounter in an organization.	2.84 (.64)
581	Standard codes for storing and transferring information: DIF	2.83 (.67)
607	Methodologies: Project management	2.83 (.62)
253	Make oral presentations.	2.83 (.64)
540	Software packages: integrated	2.83 (.66)
545	Coordinate the implementation of software.	2.82 (.60)
258	Define the part that timeliness of a message plays in the communication process.	2.82 (.59)
259*	Proofreading	2.82 (.60)
521	Identify and use computer recording media: magnetic tape	2.81 (.65)
241	Telecommunications systems: electronic mail	2.81 (.73)
586	Transmission of: graphics	2.80 (.63)
107	Develop objectives, milestones, measure work progress, and organize for project planning and control.	2.79 (.62)
249	Set up, revise,and disseminate operating guidelines for: hardware.	2.78 (.66)
104	Outline the steps in a problem-solving process and apply to information systems.	2.78 (.60)
238	Telecommunications systems: Facsimile	2.77 (.67)
511	Identify and operate the peripherals of computers: phototypesetters.	2.77 (.64)
234	Telecommunications concepts, terminology, and media: protocol	2.77 (.69)
235	Telecommunications systems: telephone	2.76 (.69)
236	Telecommunications systems: PBX	2.76 (.69)
246	Dictate reports.	2.72 (.78)
116*	Use the proper resources within an organization to find the information needed.	2.72 (.60)
239	Telecommunications systems: telex	2.67 (.65)
247	Set up, revise, and disseminate operating guidelines for: dictation equipment.	2.65 (.77)

Item #	Statement	Mean (SD) n=475
524	Importance of computers: minicomputers	2.65 (.71)
538	Software packages: accounting	2.64 (.67)
578	Operating systems: Xenix	2.63 (.68)
517	Identify and use computer recording media: floppy disks	2.59 (.76)
242	Telecommunications systems: voice mail/messaging	2.58 (.75)
623*	VMS	2.56 (.70)
248	Set up, revise,and disseminate operating guidelines for: telecommunications equipment.	2.56 (.79)
COMPETENCIES RATED AS SOMEWHAT IMPORTANT:		
523	Importance of computers: mainframes.	2.49 (.77)
625*	Experts Systems/AI	2.46 (.66)
522	Identify and use computer recording media: optical disks	2.45 (.74)
624*	ISO Standards	2.43 (.66)
582	Standard codes for storing and transferring information: DCA	2.37 (.68)
518	Identify and use computer recording media: hard disks	2.37 (.72)
Pre4*	State-of-the-art technology	2.34 (.80)
579	Standard codes for storing and transferring information: ASCII	2.32 (.64)
583	Transmission of: data	2.32 (.65)
106	Identify the main functions of management and how they apply to the automated office.	2.31 (.65)
572	Operating systems: MP/M	2.30 (.67)
513	Identify and operate the peripherals: microfilm	2.30 (.64)
574	Operating systems: MVS	2.28 (.62)
515	Identify and operate peripherals of computers: facsimile	2.28 (.67)
323	Ability to work independently	2.28 (.62)
575	Operating systems: VSE	2.26 (.60)
227	Telecommunications concepts, terminology, and media: satellites	2.24 (.58)
230	Telecommunications concepts, terminology, and media: broadband	2.23 (.63)

Item #	Statement	Mean (SD) n=475
233	Telecommunications concepts, terminology, and media: bisynchronous	2.22 (.64)
111	Apply evaluation techniques to analyze procedures, data flow, problem areas, programs, work scheduling, and control in order to effect cost reductions.	2.22 (.61)
232	Telecommunications concepts, terminology, and media: asynchronous	2.21 (.63)
226	Telecommunications concepts, terminology, and media: microwave systems	2.21 (.58)
576	Operating systems: DOS	2.20 (.58)
225	Telecommunications concepts, terminology, and media: coaxial cables	2.20 (.58)
223	Telecommunications concepts, terminology, and media: paths	2.20 (.57)
573	Operating systems: VM	2.17 (.60)
222	Telecommunications concepts, terminology, and media: circuits	2.16 (.55)
224	Telecommunications concepts, terminology, and media: telephone cables	2.16 (.56)
229	Telecommunications concepts, terminology, and media: modems	2.15 (.60)
228	Telecommunications concepts, terminology, and media: fiber optics	2.13 (.56)

*New item added in Round Two.

Legend:

100-116	Business Skills
200-260	Communications Skills
300-350	Interpersonal Skills
400-424	Management Skills
425-436	Problem Solving Skills
437-451	Intrapreneurial Skills
500-625	Technological Skills
Pre 1-5	Prerequisite Skills

area; 13 (5.75%) of the 226 statements were in the INTRAPRENEURIAL SKILLS area; and 98 (43.36%) of the 226 statements were in the TECHNOLOGICAL SKILLS area.

Also, 4 (80%) of the 5 statements relating to PREREQUISITE SKILLS obtained means which were ranked as "Very Important" by the respondents.

Of the 312 competency statements in Table 13, 30 (9.62%) were ranked as "Somewhat Important" by the respondents. Of the 30 competency statements which were ranked "Somewhat Important", 15 (50%) of the statements were in the TECHNOLOGICAL SKILLS category, and 11 (36.67%) were in the COMMUNICATIONS SKILLS category. These two categories accounted for 26 (86.67%) of the 30 task statements which were ranked as "Somewhat Important", relating in both categories to technical knowledge of equipment and telecommunications.

Of interest to note, none of the statements ranked as "Somewhat Important" was in the MANAGEMENT SKILLS, PROBLEM SOLVING SKILLS, and INTRAPRENEURIAL SKILLS categories. It appears that the respondents considered these skills to be either "Essential" or "Very Important" for information systems workers. The one PREREQUISITE SKILLS question which was ranked as "Somewhat Important" had to do with state-of-the-art technology.

Summary of the Analysis of Distinction. Of the 318 components and competency (task) statements rank ordered by means in Tables 12 and 13, 58 (18.24%) were ranked as "Essential". The largest number of "Essential" components and competency statements were noted in four areas: INTERPERSONAL SKILLS, GENERAL EDUCATION SKILLS, COMMUNICATIONS SKILLS, and TECHNOLOGICAL SKILLS.

Of the 318 components and competency (task) statements rank ordered by means in Tables 12 and 13, 232 (72.96%) were ranked as "Very Important". The "Very Important" skills were noted in BUSINESS SKILLS, MANAGEMENT SKILLS, PROBLEM SOLVING SKILLS, INTRAPRENEURIAL SKILLS, and TECHNOLOGICAL SKILLS.

In Table 13, 30 (9.62%) of the 312 competency statements were ranked as "Somewhat Important", relating mostly to technical knowledge of equipment and telecommunications. None of the components (broad skills) was rated "Somewhat Important" by the respondents.

The rank ordering of means in the Analysis of Distinction indicates a clearer picture of the specific skill areas and competency (task) statements which appear to be essential for information systems workers. It may be interesting to note that GENERAL EDUCATION SKILLS, COMMUNICATIONS SKILLS and INTERPERSONAL SKILLS were rated as important, or more important than, TECHNOLOGICAL SKILLS in both analyses.

CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

OVERVIEW OF STUDY

Office technology is developing at a rapid rate, forcing office workers to keep pace or face the danger of becoming outdated. The nature of the automated office itself is undergoing change which holds the potential for better information management, communications, and decision making along with increased job satisfaction, quality of work life, and opportunities for growth (Tapscott, 1982, p. 25).

The temptation is to focus only on the technical side and not recognize that dealing with many complex human and organizational issues in systems integration and implementation is appropriately critical.

Information workers who are prepared to adapt to change and to cope with the ambiguities of organizational restructure and technological change will be in demand for some time to come. The emphasis on the integration of information technology, organizational issues, and human concerns focuses the need for studies of this kind which will identify competencies for information workers in the automated office in order to maintain occupational viability.

The present research study was conducted to identify competencies--the skills, knowledges, and attitudes--needed by information systems workers as perceived by information systems professionals. Information systems competencies should permit office workers to compete for and maintain positions in information occupations.

SUMMARY OF METHODS AND DATABASE SOURCES

The selection of competency statements began by conducting an extensive analysis of off-line and on-line library literature. This review included a search of materials such as dissertations, theses, books, government documents, model curricula and curriculum guides, periodicals; as well as input from business and office educators and administrators, office workers, and individuals in professional organizations. The review of literature, discussions, and materials from other databases resulted in the formulation of a basic definition of information systems, the identification of basic competencies, and the selection of the methodology utilized in the study.

A DACUM (Developing A CurriculUM) committee of sixteen experts in information occupations was selected to review the definition of information systems and to determine the broad skill component areas in which the basic competency statements could be slotted. The DACUM committee was asked to initiate a list of the basic competencies needed to develop skills in the broad component categories. From these listings, a questionnaire was developed. A four-point Likert-type scale was used in the questionnaire, as follows: 4 = ESSENTIAL, 3 = VERY IMPORTANT, 2 = SOMEWHAT IMPORTANT, and 1 = NON-ESSENTIAL.

The first round questionnaire included eight broad components and 304 competency (task) statements; the second round questionnaire included the same eight skill components and 318 competency (task) statements based on input from respondents to the first round of the questionnaire.

The respondents in this study were information systems professionals who were identified as nationwide members of the Association of Information Systems Professionals (AISP). In all, 1,017 AISP members agreed to participate in the study and formed the population for this study, representing forty-six states and the District of Columbia. Of the 1,017 members, 657 (64.60%) members responded in Round One to the Information Systems Occupational Competencies Questionnaire and 475 (72.30%) of the 657 in Round One responded in Round Two to the same questionnaire.

The Delphi technique was utilized to collect the data in this study. The Delphi technique is a methodology which utilizes experts to predict future occurrences in specific fields by way of surveys. Data were collected through two iterations of the Information Systems Occupational Competencies questionnaire.

Interpretation of the data through the determination of medians and interquartile ranges and a rank ordering of the means indicated that there were skills which are essential for information systems workers. A summary of results by sections of the questionnaire is presented below.

SUMMARY OF RESULTS

Basic Components. Through agreement of the respondents, all eight of the broad components appeared to be "Essential" or "Very Important" for information systems workers: BUSINESS SKILLS, COMMUNICATIONS SKILLS, INTERPERSONAL SKILLS, MANAGEMENT SKILLS, PROBLEM SOLVING SKILLS, INTRAPRENEURIAL SKILLS, TECHNOLOGICAL SKILLS, and GENERAL EDUCATION SKILLS. Stronger agreement was indicated among the respondents for BUSINESS SKILLS, INTERPERSONAL SKILLS, and GENERAL EDUCATION SKILLS. The Analysis of Distinction which reported the skill areas by rank ordering of means supported the finding in the Delphi analysis.

BUSINESS SKILLS. Respondents indicated that the following BUSINESS SKILLS competencies were "Essential" or "Very Important" for information systems workers in both analyses: 1) supporting the organization's ethical structure and developing one's own set of ethics and value, 2) working within and analyzing the basic organizational structure to develop objectives, goals, plans, and projects and milestones to measure their progress, 3) recognizing the value of maintaining good working relationships with individuals inside and outside of the office, 4) recognizing and utilizing problem-solving processes, 5) developing and disseminating information systems procedures and policies, and 6) finding the right information at the right time. Highest agreement was attained in this section for analyzing and working within the basic business structure and developing and maintaining good working relationships with people, both inside and outside of the organization.

COMMUNICATIONS SKILLS. "Essential" or "Very Important" competencies for information systems workers as indicated by the respondents appeared to represent the following categories of communications skills in both analyses:

1) The traditional communications skills--verbal, nonverbal, listening (and asking for clarification), written (including revising and composing), questioning, grammar, punctuation, proofreading, telephone techniques, and making oral presentations; handling face-to-face, mail and telephone messages (including recognition of the timeliness of the message); identifying barriers to communication; explaining how formal and informal communications networks are used in an office--were rated necessary. The stronger agreement was found for traditional skills related to verbal and nonverbal skills,

listening, questioning, grammar/punctuation, telephone techniques, written skills of revising and composing memos, making oral presentations, identifying the major barriers to communications, explaining how formal communications networks are used in the office, and recognizing the timeliness of messages.

2) The ability to keyboard/format, revise, compose, and dictate business documents, such as letters, memos, and reports on appropriate automated or electronic equipment with appropriate software was deemed "Essential" or "Very Important". Stronger agreement among respondents was found for revising and composing memos, however.

3) Being able to define overall concepts in telecommunications was necessary; also, it was considered necessary to be able to indicate the importance of protocol and networking in telecommunications.

4) To have knowledge of telecommunications systems, such as telephone, PBX, PABX, facsimile, telex, electronic mail, voice mail/messaging, and communicating word/ information processors was found to be necessary by the respondents. The importance of facsimile and voice mail/ messaging received strong agreement.

5) Using written communications skills to develop and disseminate guidelines for dictation equipment, hardware, and software was "Essential" for information systems workers, with stronger agreement evident on being able to

develop and disseminate guidelines for software.

6) Preparing visual aids for presentations, which includes organizing the data and designing the aids, was rated as "Essential" by strong respondent agreement.

The items which were ranked as "Somewhat Important" had to do with technical telecommunications skills. Competency statements related to communications skills that were a part of the other seven broad skill areas, without exception, were consistently rated as "Essential" competencies.

INTERPERSONAL SKILLS. All but one of the items (50 of 51) in this section of the questionnaire were considered to be "Essential" or "Very Important" competencies in both analyses, clearly indicating the importance of interpersonal skills. The necessary interpersonal skills included those representative of the following areas: 1) interpersonal relations and communications, 2) personal characteristics, 3) decision making, 4) risk taking, 5) job characteristics, and 6) training/teaching competencies. Stronger agreement by the respondents was evident on such specific skills as negotiation, personal appearance, time management, self concept, loyalty, getting along with people, setting and meeting goals, initiative, interest and skills in the job, leadership ability, creativity, attitude and maturity, enthusiasm, taking risks and being adventuresome, training and teaching, research, adherence to company policies and procedures, and productivity.

The one item which was considered "Somewhat Important" or of lesser importance in the analyses had to do with the ability to work independently.

It is important to note that whenever competency (task) statements concerning interpersonal skills were included in other components, they were consistently rated "Essential".

MANAGEMENT SKILLS. All 25 items in the MANAGEMENT SKILLS section appeared to be "Essential" or "Very Important" competencies for information systems workers. These competencies were found to be characteristic of the management functions of planning, organizing, setting and meeting goals, directing, controlling, determining manpower and material needs, budgeting, creating and disseminating policies and procedures, working with people inside and outside of the organization, evaluating, analyzing cost/benefit justification, and monitoring productivity. In addition, selling and promoting the information systems to all levels of the organization were rated as "Essential" skills. Stronger group agreement appeared to highlight the importance of setting goals; organizing; determining manpower needs; preparing budgets; researching and making recommendations for hardware, software, training, and maintenance/service contracts; sensitivity to employee morale; monitoring productivity of the information systems function, usage, and design; analyzing the cost/benefit justification for information systems; and promoting and selling the information systems functions to all levels of the organization.

PROBLEM SOLVING SKILLS. The data generated by the respondents regarding PROBLEM SOLVING SKILLS indicated that all 12 of the competencies in this skill area were "Essential" or "Very Important" skills. Information systems workers would appear to need to define, recognize, analyze, break down the problem; collect relevant data; develop alternative solutions; and implement the solution; and evaluate the outcome. In addition, being able to communicate to and involve the right people in the problem-solving process appeared to be "Essential". Stronger agreement among the respondents was evident for knowing how effective problem solving can affect productivity, analyzing the problem situation, breaking down the problem, and choosing options which support defined goals to solve the problem.

INTRAPRENEURIAL SKILLS. Respondents indicated that all fifteen items in the INTRAPRENEURIAL SKILLS category were "Essential" or "Very Important" for information systems workers. Basically, these skills were in the following clusters: risk, change, strategic planning, professional development, problem solving, training, conflict resolution, and negotiating and persuasion skills.

Those competencies for which there was stronger agreement included analyzing personal risk boundaries, change, strategic planning, organizational responsibility for human resource development, personal development, problem solving, training, feedback techniques in resolving conflict, and negotiating and persuasion skills.

TECHNOLOGICAL SKILLS. "Essential" or "Very Important" TECHNOLOGICAL SKILLS for information systems workers as indicated by the Delphi respondents comprised the largest group of competencies and the largest group of competency statements. The competencies considered to be "Essential" or "Very Important" can be classified in the following manner: (1) equipment manipulation (keyboards, 10-key pad, OCRs, printers, modems, copiers, media, various software packages, including care for and handling); (2) decision making concerning selection, comparison, evaluation, recommendations, justification, and coordination concerning hardware, software, preventive maintenance, service, diagnostics, and troubleshooting; (3) research skills concerning vendors, documentation, feasibility, demonstration, and trial usage of hardware, software, and peripherals; (4) all aspects of records management; (5) critical thinking concerning floor plans, ergonomics, testing communications, security of data and facilities, comparing and analyzing software and hardware, legal considerations concerning software, systems analysis, flow charting, project management, and systems design; (6) telecommunications concepts, terminology, methodologies, and media; (7) communications concerning updating of guidelines and instructions; and (8) interpersonal skills related to enhancing information systems functions.

In both analyses, TECHNOLOGICAL SKILLS competencies which related to technical knowledge of equipment or telecommunication ranked consistently less important or "Somewhat Important" than the manipulative skills.

PREREQUISITE SKILLS. Respondents indicated that it was "Very Important" for information systems workers to enter information occupations with certain PREREQUISITE SKILLS. Specifically of importance are knowledge of office procedures and practices; BASIC programming skills; information skills related to data item ownership, usage, and manipulation for business reports; and knowledge of the information processing cycle (input, output, processing, storage/retrieval, and distribution). The one question regarding whether information systems workers need state-of-the-art technology to enter information systems occupations was considered "Somewhat Important" in both the Delphi analysis and the Analysis of Distinction.

LEVEL OF EMPLOYEE. An additional question at the conclusion of the second round of the questionnaire asked the respondents to select a category (among seven) which most nearly described the level of employee which they had considered as they completed the questionnaire. The respondents indicated their first choice as top-level administrative support (22.52%); other choices included: first-line supervisor (19.37%), technical (15.16%), professional (14.94%), managerial (15.79%), mid-level administrative support (7.16%), and entry-level administrative support (8.00%). Many respondents made more than one choice because of what they perceived to be the variety of questions in the questionnaire fitting into more than one level.

One of the basic assumptions of this study was that the identified competencies that were included in the questionnaire were entry-level skills for information systems workers. It would appear that the skills which have been rated and ranked in this study are not entry-level skills but are intended for information systems employees at a higher level of the organization, notably top-level administrative support personnel.

CONCLUSIONS

The items which were rated as "Essential" for information systems workers can be considered to have importance for the workers successfully competing for and maintaining a career in an information occupation. Survival in information occupations also appears to depend upon skills which are much broader than technological competencies and knowledges.

One of the most important skills for an information systems worker to possess appears to be interpersonal skills. Respondents consistently rated competencies (tasks) having to do with working with persons inside and outside of the organization, interfacing with all levels of employees, involving people in solving problems and implementing solutions, or acknowledging the importance of individuals within the office as "Essential" or "Very Important". Since only one of the competency statements in the INTERPERSONAL SKILLS category was rated "Somewhat Important" for information systems workers, it appears that these kinds of skills are essential for job maintenance. Personal traits, job characteristics, communications, problem solving, decision making, and risk taking fall into the category of essential competencies in this skill area.

It would appear from the findings in this study that human communications skills will make a difference on the job. Respondents consistently rated task statements concerning oral and written communications skills as "Essential" competencies. Being able to create procedures, policies, letters, memos, visual aids, making oral presentations, communicating problem solutions, and updating technical instructions were consistently rated "Essential" or "Very Important". Also, comments from respondents emphasized the importance of being able to articulate ideas, plans, and goals to all levels of employees. Becoming a keyboard specialist should not be a top priority with information systems workers, according to the results of this study.

It would appear from the findings in this study that MANAGEMENT SKILLS are important competencies for information systems workers. Two factors may be impacting this finding: (1) The literature reflects the fact that mid-level management positions are being eliminated. Hence, the normal responsibilities of this level of management are being absorbed by other workers within the organization. The need for management skills may be required by the administrative support level, as well as other levels in the organization. (2) Peter Drucker's notion of "span of communications" (1986) in the information-based organization points out the need for workers at all levels to be able to set and meet goals and objectives and control and manage work in harmony with other employees. The traditional chain of command may be altered by this phenomenon.

One other skill area for which no competency statements were developed but which also appears to be important for information systems workers is GENERAL EDUCATION SKILLS.

Technological skills remain "Essential" or "Very Important" competencies for information systems workers. Hands-on manipulation of automated equipment, software, peripherals, and media; familiarity with telecommunications and network terminology, concepts, systems, and transmission media; decision making and critical thinking skills of comparison, evaluation, and troubleshooting; communications and interpersonal skills; and a general understanding of the environment in which one is working were identified as essential technological skills. The value of this study lies with the identification and validation of specific technological skills which are necessary for occupational survival. According to the results of this study, however, technology skills should not be given precedence in importance over interpersonal, communications, and general education skills.

Respondents rated competencies in other skill areas of the questionnaire--BUSINESS SKILLS, MANAGEMENT SKILLS, PROBLEM SOLVING SKILLS, and INTRAPRENEURIAL SKILLS--as "Essential" or "Very Important" competencies for information systems workers. It would appear that organizational brightness (knowledge of structure and procedures), ethics, managerial skills of planning and organizing, problem solving steps, and acceptance of change and willingness to take risks are essential skills for information systems workers.

RECOMMENDATIONS

The present research study has illustrated that there are essential competencies--knowledges, skills, and attitudes--for information systems workers as identified by information systems professionals. It appears that persons in information occupations must possess many of these knowledges, traits, and competencies in order to compete for and maintain a position in information systems. The recommendations which follow are based on the findings of this study and are presented as guidelines for further research and for implementation of the results.

1. Two implications of this study were that the identified and validated necessary competencies should be utilized for curriculum development and improvement and on-the-job training in the area of information systems. The purpose of including these competencies should be to prepare individuals to obtain positions in information occupations, as well as to upgrade and retrain individuals who are already in these occupations. In particular, experiences in the classroom should be provided which place emphasis on developing interpersonal and communications skills, job maintenance characteristics, and personal traits, as well as technological skills.

2. A third implication of this study was that these identified and validated competencies should be used to develop or improve teacher education delivery systems and materials in the area of information systems. At the very least, teacher competencies should be compared with the identified and validated competencies in this study and

efforts made to acquire additional training or experience. In this way, teachers can effectively teach and guide others in their development of information systems occupational skills.

3. Along with curriculum development and improvement, teaching strategies should be put in place which focus on problem solving, decision making, case studies, and team work. The potential outcome of enhancing teaching strategies is to provide opportunities for students to use critical thinking skills, to learn to manage and organize thinking, to be creative in problem solving, and to work with others in developing or creating solutions for case studies or projects.

The internship as an instructional strategy could be used effectively to provide "real world" experience, along with classroom instruction.

4. Textbook publishers should put more emphasis on simulations and in-basket exercises which focus on interpersonal and communications skill development, as well as technological skill development. These types of instructional materials will greatly enhance their curricula offerings and choices.

5. These identified and validated competencies may be used to make comparisons of current occupational needs in various geographical areas of the country. They should be valuable to make adjustments for future needs and

academic programs in information occupations and provide a framework for further studies. The value of these identified competencies is that they are not representative of any one area of the country.

6. These identified and validated competencies should be used as the basis for discussions and linkages between education and business and industry. Partnerships between schools and businesses can insure that the needs and requirements of both entities are compatible and viable. In this way, individuals can be better prepared to compete for and maintain positions in a constantly-changing occupation.

7. Instructional materials and multi-media approaches could be developed to incorporate these identified competencies into existing or future curricula to facilitate classroom instruction. Additionally, a study could be undertaken to determine which of these competencies should be taught in the traditional classroom setting and which should be gained through experience on the job.

8. Future research should be undertaken to determine which of these competencies are best taught at the high school, post-secondary, and university and college levels. No effort was made in this study to determine this criterion. It may be helpful for curriculum developers to have these data available.

9. Similar studies should be undertaken on a regular basis to provide a constant source of current job competencies for information systems workers. Moreover, such studies should provide the impetus for information workers to recognize the value of continuing education. This study is intended to be only the beginning for identifying competencies for information occupations workers.

Further research could focus on a correlation between level of employee and responses to competency statements; a correlation between types of organizations and responses to competency statements; a comparison of competencies by workers and their supervisors; and a comparison of competencies by workers at different levels of the organization. Other questions which might be researched include (1) what are the future competencies for information systems workers as perceived by workers? (2) what are the future competencies for information systems workers as perceived by management?

10. This type of study may be used as the basis to survey other professional groups for purposes of comparing competencies. The results should provide an in-depth view of information occupations competencies and enhance instructional and presentational materials.

11. At the present time model curricula exist in the data processing, office systems, and secretarial domains.

The results of this study may provide the framework for the beginning of a model curricula in information systems.

12. The results of this study may have implications for the Certified Systems Professional (CSP) examination by providing input into the examination and by enhancing the content of the study guide.

REFERENCES

Adams, Lavada A. (1980) Delphi forecasting: future issues in grievance arbitration. Technological Forecasting and Social Change. 18.

Adams, Robert E. (1975) DACUM Approach to Curriculum Learning and Evaluation in Occupational Training. 2nd ed. Yarmouth, Nova Scotia: Nova Scotia NewStart, Inc.

Asselin, Yves Alain. Competencies required of clerical personnel to work in an automated office by 1990 in the Province of Quebec (Unpublished doctoral dissertation, University of Missouri-Columbia, 1984). Dissertation Abstracts International, 1984, 44, 514A. (University Microfilms No. 8512195)

Babbie, Earl R. (1973) Survey Research Methods. Belmont, CA: Wadsworth Publishing Company, Inc.

Baetz, Mary L. (1985) The Human Imperative: Planning for People in the Electronic Office. Homewood, IL: Dow Jones-Irwin.

Bailey, Andrew D., Jr.; Gerlach, James H.; and Whinston, Andrew B. (1985) Office Systems Technology and Organizations. Reston, VA: Reston Publishing Company, Inc.

Bernstein, William L. (January 1987) Apprentices of technology. Management World. 16(1).

Bikson, Tora K. and Eveland, J. D. (1986) New office technology: planning for people. Work in America Institute Studies in Productivity. New York: Pergamon Press.

Binning, D. S.; Cochran, S.; and Donatelli, B. (1972) Delphi panel to explore post-secondary education needs in the State of New Hampshire. Manchester, NH: Decision Research Incorporated.

Blaazer, Carolyn. (1984) Changing jobs in changing offices. In Alan Simpson (ed.), New Developments in Office Technology. Brookfield, VT: Gower Publishing Company.

Borg, Walter R. and Gall, Meredith D. (1983) Education Research: An Introduction. 4th ed. New York: Longman Inc.

Brockhaus, William L. and Michelsen, John F. (1977) An analysis of prior Delphi applications and some observations on its future applicability. Technological Forecasting and Social Change. 10.

Brockhoff, K. (1975) The performance of forecasting groups in computer dialogue and face-to-face discussion. In H. A. Linstone and M. Turoff (eds.) The Delphi Method: Techniques and Applications. Reading, MA: Addison-Wesley.

Brooks, K. W. (1979) Delphi technique: expanding applications. North Central Association Quarterly. 53.

Burnett, Mary Joyce and Dollar, Alta. (1986) Business communication skills essential in an information society. In Jeanette W. Vaughn, Myra Bolin, Dorothy Darby, Janis Hutchins and Shirley McClain (eds.) Challenges in Business Education. Canyon, TX: Texas Business Education Yearbook No. 5.

Burns, J. Christopher. (1978) "The Office in the 80's" in Information Systems in the 1980's. Acorn Park, Cambridge, MA: Arthur D. Little, Inc.

Burford, Anna Marie. Developing trends in office technology and career paths as related to the office of the future. (Unpublished doctoral dissertation, The Ohio State University, 1979). Dissertation Abstracts International, 1979. 40, 72A-73A. (University Microfilms No. 7915961)

Carlisle, James. (1977) Evaluating the Impact of Office Automation Systems. Proceedings of the N. C. C., Dallas, Texas.

Cicarellli, James. (1984) The future of economics. Technological Forecasting and Social Change. 25.

Cyphert, F. R. and Gant, W. L. (January 1971) The Delphi technique: a case study. Phi Delta Kappan.

"DACUM tried at Caldwell." (Spring/Summer 1979) OPEN DOORS. Raleigh, NC: North Carolina Department of Community Colleges.

Daggett, Willard R. and Branigan, Helen M. (1987) "Projections and implications of social, economic, and demographic changes for Business Education" in Margaret P. Gregory and Wanda Daniel, (Eds.) Business Education for a Changing World. Reston, VA: National Business Education Association Yearbook, 25.

Dennee, J. M. Importance and frequency of entry-level competencies as perceived by word processing supervisors, correspondence and administrative secretaries and word processing educators in Wisconsin. (Unpublished doctoral dissertation, Utah State University, 1981). Dissertation Abstracts International, 1981. 42, 1450A. (University Microfilms No. 8121374)

Denton, Keith. (January 1987) Managing "techies". Management World. 16(1).

DeVore, P. W. (January 1982) Microprocessors, robotics, and work. Man Society Technology. 41(4).

Dietz, Thomas. (1987) Methods for analyzing data from Delphi panels: some evidence from a forecasting study. Technological Forecasting and Social Change. 31.

Dole, S. H.; Fisher, G. H.; Harris, E.D.; and String, J., Jr. (1969) Establishment of a Long-Range Planning Capability. Santa Monica, CA: The RAND Corporation, RAND Report No. RM-6151-NASA.

Drucker, Peter F. (1986) The Frontiers of Management. New York: E. P. Dutton.

Ettinger, Blanche. (1982) A study of the requirements and business training procedures for word processing personnel with implications for word processing curriculum development in two-year postsecondary institutions. AERA Annual Meeting, New York, 1982. (ERIC Document Reproduction Service No. ED 213 987).

Finch, Curtis R. and Crunkilton, John R. (1984) Curriculum Development in Vocational and Technical Education: Planning, Content, and Implementation. Boston, MA: Allyn and Bacon, Inc.

Fisher, Ella H. (1987) "Integrating technological changes into the middle/secondary curriculum" in Margaret P. Gregory and Wanda Daniel, (Eds.) Business Education for a Changing World. Reston, VA: National Business Education Association Yearbook, 25.

Friedheim, Jan V. (1987) "Integrating technological changes into the two-year college curriculum" in Margaret P. Gregory and Wanda Daniel, (Eds.) Business Education for a Changing World. Reston, VA: National Business Education Association Yearbook, 25.

Giuliano, Vincent E. (September 1982) The mechanization of office work. Scientific American. 247(3).

Graves, Charlotte K. (Fall/Winter 1985) Concepts needed by managerial personnel in automated offices as perceived by office systems consultants and collegiate business faculty. The Delta Pi Epsilon Journal. XXVIII(2).

Harvey, Evelyn E. (1987) "Human relations skills for the changing office" in Margaret P. Gregory and Wanda Daniel (eds.) Business Education for a Changing World. Reston, VA: National Business Education Yearbook, 25.

Helmer, Olaf. (1966) The Use of the Delphi Technique in Problems of Educational Innovations. Santa Monica, CA: The RAND Corporation, RAND Report No. P-3499.

Helmer, Olaf. (1964) Convergence of Expert Consensus Through Feedback. Santa Monica, CA: The RAND Corporation, RAND Report No. P-2973.

Henderson, John C. and Treacy, Michael E. (Winter 1986) Managing end-user computing for competitive advantage. Sloan Management Review. 28(2).

Hill, Kim Quaile and Fowles, Jib. (1975) The methodological worth of the Delphi forecasting technique. Technological Forecasting and Social Change. 7.

Hopwood, Anthony G. (1983) "Evaluating the Real Benefits" Chapter 2 in Harry J. Otway and Malcolm Peltu (eds.), New Office Technology: Human and Organizational Aspects. Great Britain: Ablex Publishing Corp.

How "intrapreneuring" can change the face of North American business. (1983) In Joseph McKendrick (ed.), "The Generalist". Management World. 12(3).

Jarrett, Dennis. (1984) The Electronic Office: A Management Guide to the Office of the Future, 2nd edition. Brockfield, VT: Gower Publishing Company.

Joner, Jacqueline. (November 1986) Information processing needs its professionals. The Office.

Karten, Naomi. (1986) Effective corporate PC policies integrate users, business values. Data Management. 40(9).

Kleinschrod, Walter A. (1987) Update 1987-88: Approaching the Automated Office. Willow Grove, PA: Administrative Management Society Foundation.

Kruus, Peeter. (1983) Utilization of Delphi methods for university planning. Technological Forecasting and Social Change. 24.

Lucas, Henry C., Jr. and Turner, Jon A. (1982) A corporate strategy for the control of information processing. Sloan Management Review. 23(3).

Luft, Roger L. and Schoen, Janice L. (Summer 1986)' Nontechnical business employment competencies in Illinois. The Delta Pi Epsilon Journal. XXVIII(3).

Mankin, D.; Bikson, T. K.; and Gutek, B. (June 1982) The office of the future: prison or paradise? The Futurist. 16(3).

Mason, George. (October 1986) A message to business educators from a businessman. Business Education Forum. 41(1).

Meyer, N. Dean. (Winter 1983) The office automation cookbook: management strategies for getting office automation moving. Sloan Management Review. 24(2).

Michael, Donald N. (1984). Too much of a good thing? Dilemmas of an information society. Technological Forecasting and Social Change. 25.

Naisbitt, John. (1982) Megatrends. New York: Warner Books.

Nelms, Keith R. and Porter, Alan L. (1985) EFTE: an interactive Delphi method. Technological Forecasting and Society Change. 28.

Norton, Robert E. (1985) DACUM Handbook. Columbus, OH: The National Center for Research in Vocational Education.

Olney, R. J. A study to determine entry-level characteristics of prospective employees for business office positions which utilize components of systems planning and controlling. (Unpublished doctoral dissertation, University of Oklahoma, 1980). Dissertation Abstracts International, 1980. 41, 1906A. (University Microfilms No. 8024419)

O'Neil, S. L. and Prarat, E. M. (November 1982) Balancing the skills of the modern office worker. Journal of Business Education. 58(2).

O'Neil, Sharon Lund. Worker Perceptions of Skills Necessary for Survival in the World of Work. (Unpublished doctoral thesis, University of Illinois at Urbana-Champaign, 1976).

1986 Program Announcement. Des Plaines, IL: Institute for Certification of Computer Professionals, Suite 26B, 2200 E. Devon Avenue, Des Plaines, IL 60018.

Predicasts, Inc. (1983) Office of the Future. Industry Study E 90. Cleveland, OH: Predicasts, Inc.

Purchase, Alan and Glover, Carol F. (April 1976) Office of the future. Menlo Park, CA: Stanford Research Institute Business Intelligence Program Guidelines (1001).

Raymond, H. Alan. (1986) Management in the third wave. The Futurist. September-October.

Rieger, Wilfred G. (1986) Directions in Delphi developments: dissertations and their quality. Technological Forecasting and Social Change. 29.

Roessner, J. David; Mason, Robert M.; Porter, Alan L.; Rossini, Frederick A.; Schwarts, A. Perry; and Nelms, Keith R. (1985) The Impact of Office Automation on Clerical Employment, 1985-2000. Westport, CN: Quorum Books.

Roessner, J. David. (December 1985) Market Penetration of Office Automation Equipment: Trends and Forecasts. Prepared for presentation at the Sixth Internatinoal Conference on Information Systems, Indianapolis, Indiana. Atlanta, GA: Ga. Institute of Technology.

Rumberger, Russell W. and Levin, Henry M. (1985) Forecasting the impact of new technologies on the future job market. Technological Forecasting and Society Change. 27.

Ruprecht, Mary and Wagoner, Kay. (1984) Office Automation: A Management Approach. New York: John Wiley & Sons.

Scheibe, M.; Skutsch, M.; and Schofer, J. (1975) "Experiments in Delphi methodology." In H. A. Linstone and M. Turoff (eds.) The Delphi Method: Techniques and Applications. Reading, MA: Addison-Wesley.

Seel, John. (October 1985) Education: the gatekeeper in a changing economy. Business Education Forum. 40(1).

Stouffer, Bonita. (1983) The office of the future: Its impact on the postsecondary office technology programs. Journal of Business Education. 58(4).

Tapscott, Henderson, and Greenberg. (1985) Planning for Integrated Office Systems: A Strategic Approach. Homewood, IL: Dow Jones-Irwin.

Tapscott, Don. (1982) Office Automation: A User-Driven Method. New York: Plenum Press.

Taylor, James C. (Summer 1975) The human side of work: the socio-technical approach to work system design. Personnel Review. 4(3).

Toffler, Alvin. (1980) The Third Wave. New York: Morrow.

U. S. Congress, Office of Technology Assessment, Automation of America's Offices. Washington, D. C.: U. S. Government Printing Office, OTA-CIT-287, 12/85.

U. S. Department of Labor. (1983) Employment and Earnings. Vol. 30, No. 2. Washington, D. C.: U. S. Department of Labor.

Weatherman, R. and Swenson, K. (1974) "Delphi technique" in S. Hendey and J. Yates (eds.) Futurism in Education. Berkeley, CA: McCutchan Publishing.

Zuboff, Shoshana. (September/October 1982) New worlds of computer-mediated work. Harvard Business Review. 5.

APPENDIX A

List of DACUM Committee Members

List of DACUM Committee Members

Karla Back, Galveston College
Gary Baldwin, Datapoint Corporation, San Antonio
Mary Ann Beach, Dallas Morning News
Claudia Bryan, AISP National President, Fluor Daniel, Sugar Land
Susie Coon, DISC, Inc., Houston
Dona Harris, Houston Community College System
Allan J. Krueger, CSP, AISP National Director, Hanscom Air Force Base, Massachusetts
Anita Landenberger, Dallas Community College System
Leo Lefkowits, CSP, Houston
Melody Locke, DISC, Inc., Houston
Linda Mercer, CSP, Information Network, Houston
Claudia Moore, Texas Board of Higher Education, Austin
Alice Nunez, Texas State Technical Institute, Harlingen
Gay Sweet-Harris, Thomas Jefferson High School, San Antonio
Joe Voros, Houston
Molly Woods, University of Houston-Downtown

APPENDIX B

Letters to Delphi Panelists

Dear AISP Colleague:

There is a need for business and industry to identify components of and competencies for information systems workers. As information becomes more abundant and available due to technlogical changes in the office, entry-level employees must be able to understand and operate today's information-based technologies. This topic--the identification and validation of competencies for information systems workers--is the subject of my dissertation at the University of Houston.

A DACUM committee of experts, consisting of business persons from the Association of Informations Systems Professionals (AISP), business and industry representatives from around the state of Texas, and educational representatives from secondary, postsecondary, and four-year institutions have tentatively identified components of and competencies for information systems workers. It is at this point in the development of the study that I need your help. As a member of AISP, you are being asked to participate on a Delphi panel to help validate the competencies.

Being a member of a Delphi panel means (1) that you are willing to share your expertise and opinions from the luxury of your office. There are no face-to-face meetings of the panel but there is a "meeting of the minds" through participation in survey instruments; and (2) that you are willing to take the time to read and respond to the surveys more than once. On the first survey, you will be asked to respond to a wide array of competency statements. The second survey will consist of the same competency statements included in the first survey, plus any additional statements suggested by the participants. In addition, the median response for each item will be noted as feedback. If agreement is not evident from the second round of surveys, a third survey may be necessary.

Please indicate that you are willing to participate in the study as a Delphi panel member representing AISP by completing the requested information on the attached form and returning it to me at the address indicated by May 1, 1987.

I am looking forward to a positive response from you to an opportunity to contribute to a dynamic, vital profession.

Sincerely,

Donna R. Everett

Attachment

Yes, I would like to participate on the Delphi panel for the study of components of and competencies for informations systems workers.

Name: ____

Address: ____

____

____

Telephone: (____)________________ (____)________________

Return to:

Donna R. Everett
1028 Oleander
Lake Jackson, TX 77566

Dear AISP Colleague:

INFORMATION SYSTEMS OCCUPATIONAL COMPETENCIES STUDY - SURVEY #1

Thank you so much for agreeing to serve on the Delphi panel to validate the occupational competencies for information systems workers.

Enclosed you will find the questionnaire for Round 1. The first page of the instrument includes instructions for completing the questionnaire. Enclosed also is a demographics datasheet to be completed this round only.

The questionnaire is comprehensive and may require at least an hour of your time to complete. The committee who pilot tested the instrument felt that it should be as complete as possible. This first questionnaire requires you to rate the competencies and components listed and to add to the list those which you feel were not included. Round 2 of the questionnaire will include the median response for each item. Again, you will be asked to rate the components and competencies. A third survey will be needed only if there is no consensus.

Because the same set of participants must be used throughout the time of the study, it will be necessary that you sign your name and correct address. THIS SURVEY HAS BEEN REVIEWED BY THE UNIVERSITY OF HOUSTON COMMITTEE FOR THE PROTECTION OF HUMAN SUBJECTS. This means that neither your name nor your organization will be identified in any publication which may result from this study.

Since this information may be helpful to persons involved in curriculum development or improvement for their organizations, upon request I will send you a copy of the results which you will have been instrumental in helping to validate.

The end result of this study can only be as valuable as the contributors make it. Therefore, your support and assistance will be greatly appreciated. I realize that your time is extremely valuable; but I also believe that it is crucial that I receive responses from experts in the field of information systems.

Thank you again for helping with this study.

Sincerely,

Donna R. Everett

Enclosure: Survey #1

Dear AISP Colleague:

INFORMATION SYSTEMS OCCUPATIONAL COMPETENCIES STUDY - SURVEY #2

Enclosed you will find the survey instrument for Round 2 of this study. Page 1 of the survey instrument again includes instructions for completing the survey. However, there are several changes you should note before completing it:

1. The median response for each item from Survey #1 is noted as feedback. The median response is indicated in the column marked "MR" in the headings for each page. This feedback is included for informational purposes only and should in no way influence your responses to the statements.

2. During Round 1 of the study, you were asked to respond to the statements as major components or competencies for an Information Systems curriculum. During Round 2 of the survey, you are being asked to respond to the statements as important competencies for persons to possess in Information Systems occupations. This is a further validation for development of the two-year post-secondary curriculum.

3. New competency statements have been added at your suggestion and are noted at the appropriate locations throughout the survey. Your suggestions and comments to the study in general were extremely valuable in developing the curriculum.

Because we must use the same set of participants throughout the time of the survey, it will be necessary that you sign your name and correct address--again. THIS SURVEY HAS BEEN REVIEWED BY THE UNIVERSITY OF HOUSTON COMMITTEE FOR THE PROTECTION OF HUMAN SUBJECTS (713-749-3412). This means that neither your name nor your organization will be identified in any publication which may result from the study.

Your support and assistance is greatly appreciated. I realize that your time is extremely valuable; but I also believe that it is crucial that experts in Information Systems participate in this study.

Thank you again for helping with this study. Please return your completed survey by **August 7, 1987.**

Donna R. Everett

Enclosure: Survey #2

APPENDIX C

Information Systems Occupational Competencies
Survey #1

INSTRUCTIONS FOR COMPLETING THE INFORMATION SYSTEMS OCCUPATIONAL COMPETENCIES SURVEY

A. The purpose of this survey is to determine the competencies of people working in Information Systems occupations. For purposes of this study, information systems is defined as "the integration of the human, organizational, and electronic systems in an office which makes it possible to access, process, and disseminate information for decision making."

B. The survey instrument is divided into two parts:

Part I: Suggested components (broad areas) which may be required to successfully compete for and maintain a position in Information Systems.

Part II: Suggested competencies (tasks) within the broad components which demonstrate competence in an Information Systems occupation.

C. The rating scale (with accompanying explanations) for completing both parts of the survey instrument is as follows:

4 = Essential (E): (No doubt about it--A MUST!)
3 =Very Important (VI): (Important, but not essential.)
2 = Somewhat Important (SI): (Nice to have, but ...)
1 = Non-Essential (N-E): (Don't even consider it.)

Please circle the number on the scale which most nearly reflects your perception of the importance of each of the components of (Part I) and the competencies for (Part II) Information Systems occupations, as illustrated below:

	E	VI	SI	N-E
551. Evaluate and compare software packages for hardware environments.	4	3	2	1

D. Please return the completed survey instrument by **June 15, 1987.**

Survey #1

BASIC COMPONENTS FOR INFORMATION SYSTEMS OCCUPATIONS

Part I. Components for Information Systems occupations: The broad areas which include all essential elements for successful maintenance of a job in Information Systems.

Please indicate your opinion of the relative importance of each item as a major component of Information Systems occupations, using the scale below. Please circle the number which most nearly reflects your perception of the importance of each of the components:

4 = Essential (E): (No doubt about it--A MUST!)
3 = Very Important (VI): (Important, but not essential.)
2 = Somewhat Important (SI): (Nice to have, but ...)
1 = Non-Essential (N-E): (Don't even consider it.)

	COMPONENT		E	VI	SI	N-E
10.	Business Skills. (Business skills include knowledge of the organizational, procedural, ethical, and analytical nature of the office.)	10.	4	3	2	1
20.	Communications Skills. (Communications skills include the human **and** technical skills used in writing, speaking, listening, and nonverbal communication.)	20.	4	3	2	1
30.	Interpersonal Skills. (Interpersonal skills include behavorial job skills.)	30.	4	3	2	1
40.	Management/Problem Solving/ Intrapreneurial Skills. (These skills include functions associated with planning, leading, controlling, goal setting; recognition, definition, analysis of problems and implementation of solutions; and entrepreneur-like skills used in the office.)	40.	4	3	2	1

	COMPONENT		E	VI	SI	N-E
50-60.	Technological Skills. (Technological skills include the ability to manipulate equipment, hands-on skills, etc.)	50-60.	4	3	2	1
70.	General Education Skills. (General education skills include English [grammar, spelling, and punctuation], speech, math, science, etc.)	70.	4	3	2	1

(Please continue to Part II.)

BASIC COMPETENCIES FOR INFORMATION SYSTEMS OCCUPATIONS

Part II. Competencies for Information Systems occupations: Competencies are defined as those skills, attitudes, or knowledges which **demonstrate** competence in an Information Systems occupation.

Please circle the number which most nearly reflects your perception of the importance of each of the identified competencies:

4 = Essential (E): (No doubt about it--A MUST!)
3 = Very Important (VI): (Important, but not essential.)
2 = Somewhat Important (SI): (Nice to have, but ...)
1 = Non-Essential (N-E): (Don't even consider it.)

BUSINESS SKILLS COMPONENT

COMPETENCY ·		E	VI	SI	N-E
100. Work within and support the organization's ethical structure.	100.	4	3	2	1
101. Develop a set of personal ethics.	101.	4	3	2	1
102. Identify and work within the basic procedures and systems in the office; (e.g., accounting, budgeting, inventory, payroll, etc.).	102.	4	3	2	1
103. Describe the importance of individuals within the office.	103.	4	3	2	1
104. Outline the steps in a problem-solving process and apply to information systems.	104.	4	3	2	1
105. Identify the main characteristics of the various forms of organization (e.g., formal, line-staff, matrix, information, functional, line, etc.).	105.	4	3	2	1
106. Identify the main functions of management and how they apply to the automated office.	106.	4	3	2	1

	COMPETENCY		E	VI	SI	N-E
107.	Develop objectives, milestones, measure work progress, and organize for project planning and control.	107.	4	3	2	1
108.	Analyze business organizational structure for the best methods of achieving goals and productivity.	108.	4	3	2	1
109.	Work within the organizational structure to get the job done.	109.	4	3	2	1
110.	Apply statistical methods to analyze current economic conditions, database information, and market research.	110.	4	3	2	1
111.	Apply evaluation techniques to analyze procedures, data flow, problem areas, programs, work scheduling, and control in order to effect cost reductions.	111.	4	3	2	1
112.	Develop and maintain good working relationships with persons inside the organization.	112.	4	3	2	1
113.	Develop and maintain good working relationships with vendors, distributors, and outside consultants.	113.	4	3	2	1
114.	Develop, revise, disseminate, and explain to co-workers information systems procedures and policies.	114.	4	3	2	1
115.	Become familiar with business terminology as it applies to any given business environment.	115.	4	3	2	1

COMMUNICATIONS SKILLS COMPONENT

	COMPETENCY		E	VI	SI	N-E
	Indicate the importance of each of the communications skills below:					
200.	Verbal	200.	4	3	2	1
201.	Nonverbal	201.	4	3	2	1
202.	Listening	202.	4	3	2	1
203.	Written	203.	4	3	2	1
204.	Questioning	204.	4	3	2	1
205.	Grammar	205.	4	3	2	1
206.	Punctuation	206.	4	3	2	1
207.	Telephone techniques	207.	4	3	2	1
	Using automated equipment with appropriate software and peripherals, keyboard/format:					
208.	letters	208.	4	3	2	1
209.	memos	209.	4	3	2	1
210.	reports (including graphs, tables)	210.	4	3	2	1
	Using automated equipment with appropriate software and peripherals, revise:					
211.	letters	211.	4	3	2	1
212.	memos	212.	4	3	2	1
213.	reports (including graphs, tables)	213.	4	3	2	1
	Using automated equipment with appropriate software and peripherals, compose:					
214.	letters	214.	4	3	2	1
215.	memos	215.	4	3	2	1
216.	reports (including graphs, tables)	216.	4	3	2	1
217.	Receive and transmit messages from traditional sources; (e.g., telephone, face-to-face, mail systems, etc.).	217.	4	3	2	1
218.	Listen actively when given directions, asking for clarification when unsure.	218.	4	3	2	1
219.	Define concepts in telecommunications.	219.	4	3	2	1

COMPETENCY		E	VI	SI	N-E

Indicate the importance of the knowledge of the telecommunications concepts, terminology, and media listed below:

220. Channels	220.	4	3	2	1
221. Lines	221.	4	3	2	1
222. Circuits	222.	4	3	2	1
223. Paths	223.	4	3	2	1
224. Telephone cables	224.	4	3	2	1
225. Coaxial cables	225.	4	3	2	1
226. Microwave systems	226.	4	3	2	1
227. Satellites	227.	4	3	2	1
228. Fiber optics	228.	4	3	2	1
229. Modems	229.	4	3	2	1
230. Broadband	230.	4	3	2	1
231. Baseband	231.	4	3	2	1
232. Asynchronous	232.	4	3	2	1
233. Bisynchronous	233.	4	3	2	1
234. Protocol	234.	4	3	2	1

Indicate the importance of knowledge about the telecommunications systems listed below:

235. Telephone	235.	4	3	2	1
236. PBX	236.	4	3	2	1
237. PABX	237.	4	3	2	1
238. Facsimile	238.	4	3	2	1
239. Telex	239.	4	3	2	1
240. TWX	240.	4	3	2	1
241. Electronic mail	241.	4	3	2	1
242. Voice mail/messaging	242.	4	3	2	1
243. Communicating word/information processors (dedicated, PC's, host)	243.	4	3	2	1

Using dictating machine/recorder, dictate:

244. letters	244.	4	3	2	1
245. memos	245.	4	3	2	1
246. reports	246.	4	3	2	1

	COMPETENCY		E	VI	SI	N-E
	Set up, revise, and disseminate operating guidelines in an office for:					
247.	dictation equipment.	247.	4	3	2	1
248.	telecommunications equipment.	248.	4	3	2	1
249.	hardware.	249.	4	3	2	1
250.	software.	250.	4	3	2	1
251.	Develop and prepare visual aids for use in presentations.	251.	4	3	2	1
252.	Design, organize data for, and create visual aids for use in presentations.	252.	4	3	2	1
253.	Make oral presentations.	253.	4	3	2	1
254.	Identify the major barriers to communication that a person may encounter in an organization.	254.	4	3	2	1
255.	Explain the importance of the different kinds of nonverbal communication in the messages transmitted and received.	255.	4	3	2	1
256.	Explain how formal (upward, downward) communication networks are used in the office.	256.	4	3	2	1
257.	Explain how informal (lateral) communication networks are used in the office.	257.	4	3	2	1
258.	Define the part that timeliness of a message plays in the communication process.	258.	4	3	2	1

4 = Essential (E): (No doubt about it--A MUST!)
3 = Very Important (VI): (Important, but not essential.)
2 = Somewhat Important (SI): (Nice to have, but ...)
1 = Non-Essential (N-E): (Don't even consider it.)

INTERPERSONAL SKILLS COMPONENT

Indicate the importance of the interpersonal skills listed below:

	COMPETENCY		E	VI	SI	N-E
300.	Communications	300.	4	3	2	1
301.	Delegation	301.	4	3	2	1
302.	Negotiation	302.	4	3	2	1
303.	Persuasion	303.	4	3	2	1
304.	Motivation	304.	4	3	2	1
305.	Sense of humor	305.	4	3	2	1
306.	Personal appearance	306.	4	3	2	1
307.	Neatness of work, work area	307.	4	3	2	1
308.	Dependability	308.	4	3	2	1
309.	Reliability	309.	4	3	2	1
310.	Time management	310.	4	3	2	1
311.	Concept of self	311.	4	3	2	1
312.	Loyalty	312.	4	3	2	1
313.	Sense of urgency/meeting deadlines	313.	4	3	2	1
314.	Pride in self, work, department, and company	314.	4	3	2	1
315.	Getting along with people (all levels)	315.	4	3	2	1
316.	Setting and meeting goals	316.	4	3	2	1
317.	Personal development plans/goals	317.	4	3	2	1
318.	Problem solving	318.	4	3	2	1
319.	Decision making/judgment	319.	4	3	2	1
320.	Professionalism (including ethics, morals, values)	320.	4	3	2	1
321.	Community involvement (service)	321.	4	3	2	1
322.	Initiative/self-starter	322.	4	3	2	1
323.	Ability to work independently	323.	4	3	2	1
324.	Planning and organizing	324.	4	3	2	1
325.	Interest in job	325.	4	3	2	1
326.	Knowledge of job	326.	4	3	2	1
327.	Leadership ability	327.	4	3	2	1
328.	Creativity	328.	4	3	2	1
329.	Attitude	329.	4	3	2	1

	COMPETENCY		E	VI	SI	N-E
330.	Attendance (on time, record of)	330.	4	3	2	1
331.	Job skills	331.	4	3	2	1
332.	Enthusiasm	332.	4	3	2	1
333.	Risk taker	333.	4	3	2	1
334.	"Extra" efforts	334.	4	3	2	1
335.	Acceptance of criticism	335.	4	3	2	1
336.	Team player	336.	4	3	2	1
337.	Self-confidence	337.	4	3	2	1
338.	Follow-up and follow-through	338.	4	3	2	1
339.	Sense of responsibility	339.	4	3	2	1
340.	Adventuresome (willing to learn new things)	340.	4	3	2	1
341.	Training/teaching ability	341.	4	3	2	1
342.	Helpfulness/cooperative	342.	4	3	2	1
343.	Knowledge of and adherence to company policies and procedures	343.	4	3	2	1
344.	Flexibility	344.	4	3	2	1
345.	Respect for work area and equipment	345.	4	3	2	1
346.	Research skills	346.	4	3	2	1
347.	Cost consciousness	347.	4	3	2	1
348.	Maturity	348.	4	3	2	1
349.	Productivity	349.	4	3	2	1

4 = Essential (E): (No doubt about it--A MUST!)
3 = Very Important (VI): (Important, but not essential.)
2 = Somewhat Important (SI): (Nice to have, but ...)
1 = Non-Essential (N-E): (Don't even consider it.)

MANAGEMENT/PROBLEM SOLVING/INTRAPRENEURIAL SKILLS COMPONENT

	COMPETENCY		E	VI	SI	N-E
	Management Skills:					
400.	Define the functions of management.	400.	4	3	2	1
401.	Demonstrate the ability to set goals or plans for the information systems functions in an office.	401.	4	3	2	1
402.	Demonstrate the ability to organize the information systems functions in an office.	402.	4	3	2	1
403.	Demonstrate the ability to control the information systems functions in an office.	403.	4	3	2	1
404.	Demonstrate the ability to lead or direct the people to attain the goals for information systems in an office.	404.	4	3	2	1
405.	Determine the manpower needs for information systems in an office.	405.	4	3	2	1
406.	Determine the materials needed for information systems functions in an office, (e.g., hardware, software, media, peripherals, etc.).	406.	4	3	2	1
407.	Prepare a budget for the elements of the information systems functions in an office.	407.	4	3	2	1
408.	Create, revise, and disseminate the policies, procedures, and methods to be used in the information systems functions in an office.	408.	4	3	2	1

COMPETENCY		E	VI	SI	N-E
Research, evaluate, and make recommendations for setting up/ maintaining/upgrading the following information systems functions in an office:					
409. hardware	409.	4	3	2	1
410. software	410.	4	3	2	1
411. peripherals	411.	4	3	2	1
412. media	412.	4	3	2	1
413. training	413.	4	3	2	1
414. maintenance/service contracts	414.	4	3	2	1
415. lease/purchase agreements	415.	4	3	2	1
416. Be sensitive to the morale of the individuals in the office.	416.	4	3	2	1
417. Monitor the productivity of the information systems functions in an office.	417.	4	3	2	1
418. Develop and maintain good working relationships with vendors and distributors outside of the office.	418.	4	3	2	1
419. Develop and maintain good working relationships with persons at all levels in the office.	419.	4	3	2	1
420. Analyze the productivity and effectiveness of use and design of the information system.	420.	4	3	2	1
421. Analyze the cost/benefit justification of the information systems in an office.	421.	4	3	2	1
422. Maintain constant evaluation of equipment and network needs at the end user level.	422.	4	3	2	1
423. Promote the information systems functions to all levels of the organization.	423.	4	3	2	1

	COMPETENCY		E	VI	SI	N-E
424.	Develop a marketing presentation package to sell to upper management.	424.	4	3	2	1
	Problem Solving Skills:					
425.	Define and describe the problem.	425.	4	3	2	1
426.	Explain how productivity may be dependent on adequate problem solving in the office.	426.	4	3	2	1
427.	Analyze the situation to get the basic facts and feelings of the situation.	427.	4	3	2	1
428.	Break down the problem into the essential elements and issues and clarify goals concerning the problem situation.	428.	4	3	2	1
429.	Collect relevant/irrelevant data regarding the problem and issues.	429.	4	3	2	1
430.	Develop and analyze alternate solutions to the problem.	430.	4	3	2	1
431.	Choose from the options and compare defined goal with the possible ways of solving problem.	431.	4	3	2	1
432.	Implement the solution.	432.	4	3	2	1
433.	Create the kind of environment where problems are seen as challenges, not as roadblocks and stumbling stones.	433.	4	3	2	1
434.	Be sensitive to the areas in an office where problems may arise; (e.g., human, economic, systems).	434.	4	3	2	1
435.	Communicate the solution to the problem to the people involved, taking into account the factors of verbal and nonverbal communication.	435.	4	3	2	1

	COMPETENCY		E	VI	SI	N-E
436.	Involve the right people in the analysis, implementation, and evaluation of the problem and its solution.	436.	4	3	2	1

Intrapreneurial Skills:

	COMPETENCY		E	VI	SI	N-E
437.	Analyze the boundaries of risk which an organization is willing to set for individuals.	437.	4	3	2	1
438.	Analyze one's personal risk boundaries in order to determine the amount of risk one is willing to take to get the job done.	438.	4	3	2	1
439.	Define the climate for change in an office environment (e.g., the expectations for, encouragement of, and the willingness of an organization to effect change in itself and in individuals).	439.	4	3	2	1
440.	Determine the extent to which the individual is willing to accept or reject change within an office environment.	440.	4	3	2	1
441.	Be aware of the effect of change on others in the organization.	441.	4	3	2	1
442.	Outline the procedures and components of strategic planning.	442.	4	3	2	1
443.	Determine the extent to which an individual is encouraged by an organization to develop himself/herself.	443.	4	3	2	1
444.	Determine the willingness of an organization to develop its human resources (e.g., the use of on-the-job and off-the-job professional development opportunities).	444.	4	3	2	1

	COMPETENCY		E	VI	SI	N-E
445.	Take advantage of opportunities to develop one's own capabilities on one's own time.	445.	4	3	2	1
446.	Given a problem, use acquired knowledge to demonstrate the ability to analyze and evaluate a situation and present a workable solution in the best interest of the organization.	446.	4	3	2	1
447.	Coordinate, set up, and conduct training for all levels of employees within an organization.	447.	4	3	2	1
448.	Employ conflict resolution techniques in order to bring about positive outcomes of conflict.	448.	4	3	2	1
449.	Demonstrate knowledge of feedback techniques in resolving conflict.	449.	4	3	2	1
450.	Utilize negotiating skills in the office.	450.	4	3	2	1
451.	Utilize persuasion skills in the office.	451.	4	3	2	1

4 = Essential (E): (No doubt about it--A MUST!)
3 = Very Important (VI): (Important, but not essential.)
2 = Somewhat Important (SI): (Nice to have, but ...)
1 = Non-Essential (N-E): (Don't even consider it.)

TECHNOLOGICAL SKILLS COMPONENT

	COMPETENCY		E	VI	SI	N-E
500.	Demonstrate "touch" proficiency in computer keyboard operation.	500.	4	3	2	1
	Specifically, "touch" proficiency of:					
501.	Alphabetic keys	501.	4	3	2	1
502.	Numeric keys	502.	4	3	2	1
503.	Symbolic keys	503.	4	3	2	1
504.	Function keys	504.	4	3	2	1
505.	10-key pad	505.	4	3	2	1
Identify and operate the input elements of computers:						
506.	Keyboards	506.	4	3	2	1
507.	OCRs	507.	4	3	2	1
508.	Communicating word processors	508.	4	3	2	1
509.	Voice processors	509.	4	3	2	1
Identify and operate the peripherals of computers:						
510.	Printers	510.	4	3	2	1
511.	Phototypesetters	511.	4	3	2	1
512.	Modems	512.	4	3	2	1
513.	Microfilm	513.	4	3	2	1
514.	Copiers	514.	4	3	2	1
515.	Facsimile	515.	4	3	2	1
516.	Plotters	516.	4	3	2	1
Identify and use the following computer recording media:						
517.	Floppy disks	517.	4	3	2	1
518.	Hard disks	518.	4	3	2	1
519.	CD-ROM	519.	4	3	2	1
520.	Cassettes	520.	4	3	2	1
521.	Magnetic tape	521.	4	3	2	1
522.	Optical disks	522.	4	3	2	1

COMPETENCY		E	VI	SI	N-E
Know the importance of the computers itemized below in the office environment:					
523. Mainframes	523.	4	3	2	1
524. Minicomputers	524.	4	3	2	1
525. Microcomputers	525.	4	3	2	1
Identify the factors in the selection of:					
526. storage systems.	526.	4	3	2	1
527. retrieval systems.	527.	4	3	2	1
528. Evaluate, set up, and maintain a records inventory program (which might include records transfer, records retention, and records destruction).	528.	4	3	2	1
529. Demonstrate hands-on operational knowledge of software packages.	529.	4	3	2	1
Specifically, the relative importance of the software packages itemized below:					
530. Word processing	530.	4	3	2	1
531. Spreadsheet	531.	4	3	2	1
532. Database	532.	4	3	2	1
533. Graphics	533.	4	3	2	1
534. Desktop management	534.	4	3	2	1
535. Records management	535.	4	3	2	1
536. Inventory control	536.	4	3	2	1
537. Telecommunications	537.	4	3	2	1
538. Accounting	538.	4	3	2	1
539. Electronic mail system	539.	4	3	2	1
540. Integrated	540.	4	3	2	1
Evaluate, recommend, and justify:					
541. the most appropriate hardware for an office environment.	541.	4	3	2	1
542. the most appropriate software for an office environment.	542.	4	3	2	1

COMPETENCY		E	VI	SI	N-E
543. Evaluate appropriateness of preventive maintenance and service contracts for automated office hardware and software.	543.	4	3	2	1
544. Design the floor plan for hardware configuration in an office environment.	544.	4	3	2	1
Coordinate the implementation of:					
545. software.	545.	4	3	2	1
546. hardware.	546.	4	3	2	1
547. Utilize batch, on-time, real time, time sharing, shared logic, or shared resource processing.	547.	4	3	2	1
Recognize and request the appropriate service for:					
548. hardware malfunctions.	548.	4	3	2	1
549. software malfunctions.	549.	4	3	2	1
550. Determine problems and complete equipment diagnostics through troubleshooting.	550.	4	3	2	1
551. Evaluate and compare software packages for hardware environments.	551.	4	3	2	1
552. Demonstrate an operational knowledge of electronic communications by developing and testing data communications.	552.	4	3	2	1
Indicate the importance of knowledge of electronic communications of:					
553. Data	553.	4	3	2	1
554. Text	554.	4	3	2	1
555. Voice	555.	4	3	2	1
556. Graphics	556.	4	3	2	1
557. Networks	557.	4	3	2	1
558. Teleconferencing	558.	4	3	2	1
559. Electronic mail	559.	4	3	2	1

COMPETENCY		E	VI	SI	N-E
560. Identify and define needed features and functions of operations systems software.	560.	4	3	2	1
561. Identify and define needed features and functions of applications software.	561.	4	3	2	1
562. Identify the legal aspects of an information system; (e.g., information ownership, copyrights vs public domain, licensing).	562.	4	3	2	1
Describe the need for:					
563. security of data.	563.	4	3	2	1
564. security of facilities.	564.	4	3	2	1
Exhibit research skills which demonstrate ability to:					
565. locate vendors	565.	4	3	2	1
566. locate documentation	566.	4	3	2	1
567. locate new sources and new techniques for implementing, changing, and/or upgrading existing equipment.	567.	4	3	2	1
568. Identify ergonomic factors in the selection of equipment.	568.	4	3	2	1
Define the strengths/weaknesses and similarities/differences of the following operating systems:					
569. PC-DOS	569.	4	3	2	1
570. MS-DOS	570.	4	3	2	1
571. CP/M	571.	4	3	2	1
572. MP/M	572.	4	3	2	1
573. VM	573.	4	3	2	1
574. MVS	574.	4	3	2	1
575. VSE	575.	4	3	2	1
576. DOS	576.	4	3	2	1
577. Unix	577.	4	3	2	1
578. Xenix	578.	4	3	2	1

COMPETENCY		E	VI	SI	N-E
Define the similarities and the differences in standard codes for storing and transferring information:					
579. ASCII	579.	4	3	2	1
580. EBCDIC	580.	4	3	2	1
581. DIF	581.	4	3	2	1
582. DCA	582.	4	3	2	1
Utilize methodologies, protocols, and systems for transmission of:					
583. data	583.	4	3	2	1
584. text	584.	4	3	2	1
585. voice	585.	4	3	2	1
586. graphics	586.	4	3	2	1
Demonstrate a knowledge of the following communications terminology in information systems:					
587. networks (LANs, WANs)	587.	4	3	2	1
588. voice (synthesis, recognition)	588.	4	3	2	1
589. electronic mail	589.	4	3	2	1
590. teleconferencing	590.	4	3	2	1
591. compatibility	591.	4	3	2	1
592. connectivity	592.	4	3	2	1
593. conversion	593.	4	3	2	1
594. protocols	594.	4	3	2	1
595. expandability	595.	4	3	2	1
596. interface	596.	4	3	2	1
597. interactive	597.	4	3	2	1
598. editability	598.	4	3	2	1
599. processability	599.	4	3	2	1
600. Develop, use, and maintain a disaster recovery plan.	600.	4	3	2	1
Care for and handle:					
601. computer software.	601.	4	3	2	1
602. computer hardware.	602.	4	3	2	1
603. computer peripherals.	603.	4	3	2	1
604. computer media.	604.	4	3	2	1

COMPETENCY		E	VI	SI	N-E
Indicate your opinion of the importance of each of the methodologies itemized below to the person in an Information Systems occupation:					
605. Systems analysis	605.	4	3	2	1
606. Flow charting	606.	4	3	2	1
607. Project management	607.	4	3	2	1
608. Systems design	608.	4	3	2	1
609. Software installation	609.	4	3	2	1
610. Hardware installation	610.	4	3	2	1
611. Modify or change the defaults in a software applications package.	611.	4	3	2	1
612. Update technical instructions or procedures for equipment use based on systems changes and/or upgrading.	612.	4	3	2	1
613. Interface with all levels of employees in the office to enhance information systems.	613.	4	3	2	1
614. Analyze work flow in the office to determine the best use of equipment.	614.	4	3	2	1
615. Conduct feasibility studies for the automated office.	615.	4	3	2	1
Set up demonstrations and trial usage for:					
616. hardware	616.	4	3	2	1
617. software	617.	4	3	2	1
618. peripherals	618.	4	3	2	1
619. Upload and download between micro and mainframe.	619.	4	3	2	1

Please use the space below to add any general comments or suggestions about the contents of the survey, the format of the survey, or the study.

Before you sign, you should know that no individual or institution will be identified in any publicity or publication which may result from this study.

Name_______________________________

Address_____________________________

____

____

Return the completed survey by **June 15, 1987.** Staple the addressed, stamped survey closed and drop in the mail. Thank you!

APPENDIX D

Information Systems Occupational Competencies Survey #2

INSTRUCTIONS FOR COMPLETING THE INFORMATION SYSTEMS OCCUPATIONAL COMPETENCIES SURVEY

A. The purpose of this survey is to determine the competencies of people working in Information Systems occupations. For purposes of this study, information systems is defined as "the integration of the human, organizational, and electronic systems in an office which makes it possible to access, process, and disseminate information for decision making."

B. The survey instrument is divided into two parts:

Part I: Suggested components (broad areas) which may be required to successfully compete for and maintain a position in Information Systems.

Part II: Suggested competencies (tasks) within the broad components which demonstrate competence in an Information Systems occupation.

New competency statements have been added where you suggested.

C. The rating scale (with accompanying explanations) for completing both parts of the survey instrument is as follows:

4 = Essential (E): (No doubt about it--A MUST!)
3 =Very Important (VI): (Important, but not essential.)
2 = Somewhat Important (SI): (Nice to have, but ...)
1 = Non-Essential (N-E): (Don't even consider it.)
(**MR = Indicates median response of group.)

Please circle the number on the scale which most nearly reflects your perception of the importance of each of the components of (Part I) and the competencies for (Part II) Information Systems occupations, as illustrated below:

	E	VI	SI	N-E
551. Evaluate and compare software packages for hardware environments.	4	3	2	1

D. Please return the completed survey instrument by **August 7, 1987.**

**Median response of survey participants provided as feedback from the first round of surveys.

Survey #2

BASIC COMPONENTS FOR INFORMATION SYSTEMS OCCUPATIONS

Part I. Components for Information Systems occupations: The broad areas which include all essential elements for successful maintenance of a job in Information Systems.

Please indicate your opinion of the relative importance of each item as a major component of Information Systems occupations, using the scale below. Please circle the number which most nearly reflects your perception of the importance of each of the components:

4 = Essential (E): (No doubt about it--A MUST!)
3 = Very Important (VI): (Important, but not essential.)
2 = Somewhat Important (SI): (Nice to have, but ...)
1 = Non-Essential (N-E): (Don't even consider it.)
(MR = Indicates median response of group.)

	COMPONENT		E	VI	SI	N-E	MR
10.	Business Skills. (Business skills include knowledge of the organizational, procedural, ethical, and analytical nature of the office.)	10.	4	3	2	1	3
20.	Communications Skills. (Communications skills include the human **and** technical skills used in writing, speaking, listening, and nonverbal communication.)	20.	4	3	2	1	4
30.	Interpersonal Skills. (Interpersonal skills include behavorial job skills.)	30.	4	3	2	1	3
40.	Management/Problem Solving/ Intrapreneurial Skills. (These skills include functions associated with planning, leading, controlling, goal setting; recognition, definition, analysis of problems and implementation of solutions; and entrepreneur-like skills used in the office.)	40.	4	3	2	1	3

	COMPONENT		E	VI	SI	N-E	MR
50-60.	Technological Skills. (Technological skills include the ability to manipulate equipment, hands-on skills, etc.)	50-60.	4	3	2	1	4
70.	General Education Skills. (General education skills include English [grammar, spelling, and punctuation], speech, math, science, etc.)	70.	4	3	2	1	3

***

What is your perception of the importance of the following **prerequisite** skills for the person entering an Information Systems occupation:

1.	Office practices and procedures.	4	3	2	1
2.	Information skills which include: --what data items are essential to the business; --what data items are essential in each of the reports used to manage the business; --who "owns" each data item; --who "uses" each data item; --what "derived" data items are formed from basic data items.	4	3	2	1
3.	BASIC programming skills.	4	3	2	1
4.	State-of-the-art technology.	4	3	2	1
5.	Knowledge of the information processing cycle: input, output, processing, storage/retrieval, and distribution.	4	3	2	1

(Please continue to Part II.)

BASIC COMPETENCIES FOR INFORMATION SYSTEMS OCCUPATIONS

Part II. Competencies for Information Systems occupations: Competencies are defined as those skills, attitudes, or knowledges which **demonstrate** competence in an Information Systems occupation.

Please circle the number which most nearly reflects your perception of the importance of each of the identified competencies:

4 = Essential (E): (No doubt about it--A MUST!)
3 = Very Important (VI): (Important, but not essential.)
2 = Somewhat Important (SI): (Nice to have, but ...)
1 = Non-Essential (N-E): (Don't even consider it.)
(MR = Indicates the median response of group.)

BUSINESS SKILLS COMPONENT

COMPETENCY		E	VI	SI	N-E	MR
100. Work within and support the organization's ethical structure.	100.	4	3	2	1	3
101. Develop a set of personal ethics.	101.	4	3	2	1	3
102. Identify and work within the basic procedures and systems in the office; (e.g., accounting, budgeting, inventory, payroll, etc.).	102.	4	3	2	1	3
103. Describe the importance of individuals within the office.	103.	4	3	2	1	3
104. Outline the steps in a problem-solving process and apply to information systems.	104.	4	3	2	1	3
105. Identify the main characteristics of the various forms of organization (e.g., formal, line-staff, matrix, information, functional, line, etc.).	105.	4	3	2	1	2
106. Identify the main functions of management and how they apply to the automated office.	106.	4	3	2	1	3

	COMPETENCY		E	VI	SI	N-E	MR
107.	Develop objectives, milestones, measure work progress, and organize for project planning and control.	107.	4	3	2	1	3
108.	Analyze business organizational structure for the best methods of achieving goals and productivity.	108.	4	3	2	1	3
109.	Work within the organizational structure to get the job done.	109.	4	3	2	1	3
110.	Apply statistical methods to analyze current economic conditions, database information, and market research.	110.	4	3	2	1	2
111.	Apply evaluation techniques to analyze procedures, data flow, problem areas, programs, work scheduling, and control in order to effect cost reductions.	111.	4	3	2	1	3
112.	Develop and maintain good working relationships with persons inside the organization.	112.	4	3	2	1	4
113.	Develop and maintain good working relationships with vendors, distributors, and outside consultants.	113.	4	3	2	1	3
114.	Develop, revise, disseminate, and explain to co-workers information systems procedures and policies.	114.	4	3	2	1	3
115.	Become familiar with business terminology as it applies to any given business environment.	115.	4	3	2	1	3
*116.	Use the proper resources within an organization to find the information needed.	116.	4	3	2	1	

(MR = Indicates median response of group.)

COMMUNICATIONS SKILLS COMPONENT

	COMPETENCY		E	VI	SI	N-E	MR
	Indicate the importance of each of the communications skills below:						
200.	Verbal	200.	4	3	2	1	4
201.	Nonverbal	201.	4	3	2	1	3
202.	Listening	202.	4	3	2	1	4
203.	Written	203.	4	3	2	1	4
204.	Questioning	204.	4	3	2	1	4
205.	Grammar	205.	4	3	2	1	4
206.	Punctuation	206.	4	3	2	1	4
207.	Telephone techniques	207.	4	3	2	1	3
	Using automated equipment with appropriate software and peripherals, keyboard/format:						
208.	letters	208.	4	3	2	1	4
209.	memos	209.	4	3	2	1	4
210.	reports (including graphs, tables)	210.	4	3	2	1	4
	Using automated equipment with appropriate software and peripherals, revise:						
211.	letters	211.	4	3	2	1	4
212.	memos	212.	4	3	2	1	4
213.	reports (including graphs, tables)	213.	4	3	2	1	4
	Using automated equipment with appropriate software and peripherals, compose:						
214.	letters	214.	4	3	2	1	3
215.	memos	215.	4	3	2	1	3
216.	reports (including graphs, tables)	216.	4	3	2	1	3
217.	Receive and transmit messages from traditional sources; (e.g., telephone, face-to-face, mail systems, etc.).	217.	4	3	2	1	3
218.	Listen actively when given directions, asking for clarification when unsure.	218.	4	3	2	1	4
219.	Define concepts in telecommunications.	219.	4	3	2	1	3

COMPETENCY		E	VI	SI	N-E	MR
Indicate the importance of the knowledge of the telecommunications concepts, terminology, and media listed below:						
220. Channels	220.	4	3	2	1	2
221. Lines	221.	4	3	2	1	2
222. Circuits	222.	4	3	2	1	2
223. Paths	223.	4	3	2	1	2
224. Telephone cables	224.	4	3	2	1	2
225. Coaxial cables	225.	4	3	2	1	2
226. Microwave systems	226.	4	3	2	1	2
227. Satellites	227.	4	3	2	1	2
228. Fiber optics	228.	4	3	2	1	2
229. Modems	229.	4	3	2	1	3
230. Broadband	230.	4	3	2	1	2
231. Baseband	231.	4	3	2	1	2
232. Asynchronous	232.	4	3	2	1	3
233. Bisynchronous	233.	4	3	2	1	3
234. Protocol	234.	4	3	2	1	3
Indicate the importance of knowledge about the telecommunications systems listed below:						
235. Telephone	235.	4	3	2	1	4
236. PBX	236.	4	3	2	1	3
237. PABX	237.	4	3	2	1	3
238. Facsimile	238.	4	3	2	1	3
239. Telex	239.	4	3	2	1	3
240. TWX	240.	4	3	2	1	2
241. Electronic mail	241.	4	3	2	1	3
242. Voice mail/messaging	242.	4	3	2	1	3
243. Communicating word/information processors (dedicated, PC's, host)	243.	4	3	2	1	3
Using dictating machine/recorder, dictate:						
244. letters	244.	4	3	2	1	3
245. memos	245.	4	3	2	1	2
246. reports	246.	4	3	2	1	2

COMPETENCY		E	VI	SI	N-E	MR
Set up, revise, and disseminate operating guidelines in an office for:						
247. dictation equipment.	247.	4	3	2	1	3
248. telecommunications equipment.	248.	4	3	2	1	3
249. hardware.	249.	4	3	2	1	3
250. software.	250.	4	3	2	1	3
251. Develop and prepare visual aids for use in presentations.	251.	4	3	2	1	3
252. Design, organize data for, and create visual aids for use in presentations.	252.	4	3	2	1	3
253. Make oral presentations.	253.	4	3	2	1	3
254. Identify the major barriers to communication that a person may encounter in an organization.	254.	4	3	2	1	3
255. Explain the importance of the different kinds of nonverbal communication in the messages transmitted and received.	255.	4	3	2	1	3
256. Explain how formal (upward, downward) communication networks are used in the office.	256.	4	3	2	1	3
257. Explain how informal (lateral) communication networks are used in the office.	257.	4	3	2	1	3
258. Define the part that timeliness of a message plays in the communication process.	258.	4	3	2	1	3
New statements:						
259. Proofreading	259.	4	3	2	1	
260. Networking	260.	4	3	2	1	

4 = Essential (E): (No doubt about it--A MUST!)
3 = Very Important (VI): (Important, but not essential.)
2 = Somewhat Important (SI): (Nice to have, but ...)
1 = Non-Essential (N-E): (Don't even consider it.)
(MR = Indicates median response of group.)

INTERPERSONAL SKILLS COMPONENT

Indicate the importance of the interpersonal skills listed below:

	COMPETENCY		E	VI	SI	N-E	MR
300.	Communications	300.	4	3	2	1	4
301.	Delegation	301.	4	3	2	1	3
302.	Negotiation	302.	4	3	2	1	3
303.	Persuasion	303.	4	3	2	1	3
304.	Motivation	304.	4	3	2	1	4
305.	Sense of humor	305.	4	3	2	1	3
306.	Personal appearance	306.	4	3	2	1	3
307.	Neatness of work, work area	307.	4	3	2	1	3
308.	Dependability	308.	4	3	2	1	4
309.	Reliability	309.	4	3	2	1	4
310.	Time management	310.	4	3	2	1	4
311.	Concept of self	311.	4	3	2	1	3
312.	Loyalty	312.	4	3	2	1	3
313.	Sense of urgency/meeting deadlines	313.	4	3	2	1	4
314.	Pride in self, work, department, and company	314.	4	3	2	1	4
315.	Getting along with people (all levels)	315.	4	3	2	1	4
316.	Setting and meeting goals	316.	4	3	2	1	3
317.	Personal development plans/goals	317.	4	3	2	1	3
318.	Problem solving	318.	4	3	2	1	3
319.	Decision making/judgment	319.	4	3	2	1	4
320.	Professionalism (including ethics, morals, values)	320.	4	3	2	1	4
321.	Community involvement (service)	321.	4	3	2	1	2
322.	Initiative/self-starter	322.	4	3	2	1	3
323.	Ability to work independently	323.	4	3	2	1	4
324.	Planning and organizing	324.	4	3	2	1	3
325.	Interest in job	325.	4	3	2	1	4
326.	Knowledge of job	326.	4	3	2	1	4
327.	Leadership ability	327.	4	3	2	1	3
328.	Creativity	328.	4	3	2	1	3
329.	Attitude	329.	4	3	2	1	4

	COMPETENCY		E	VI	SI	N-E	MR
330.	Attendance (on time, record of)	330.	4	3	2	1	4
331.	Job skills	331.	4	3	2	1	4
332.	Enthusiasm	332.	4	3	2	1	3
333.	Risk taker	333.	4	3	2	1	3
334.	"Extra" efforts	334.	4	3	2	1	3
335.	Acceptance of criticism	335.	4	3	2	1	3
336.	Team player	336.	4	3	2	1	4
337.	Self-confidence	337.	4	3	2	1	3
338.	Follow-up and follow-through	338.	4	3	2	1	4
339.	Sense of responsibility	339.	4	3	2	1	4
340.	Adventuresome (willing to learn new things)	340.	4	3	2	1	3
341.	Training/teaching ability	341.	4	3	2	1	3
342.	Helpfulness/cooperative	342.	4	3	2	1	3
343.	Knowledge of and adherence to company policies and procedures	343.	4	3	2	1	3
344.	Flexibility	344.	4	3	2	1	4
345.	Respect for work area and equipment	345.	4	3	2	1	3
346.	Research skills	346.	4	3	2	1	3
347.	Cost consciousness	347.	4	3	2	1	3
348.	Maturity	348.	4	3	2	1	3
349.	Productivity	349.	4	3	2	1	3

New statement:

350.	Honest, truthworthy	350.	4	3	2	1	

4 = Essential (E): (No doubt about it--A MUST!)
3 = Very Important (VI): (Important, but not essential.)
2 = Somewhat Important (SI): (Nice to have, but ...)
1 = Non-Essential (N-E): (Don't even consider it.)
(MR = Indicates median response of group.)

MANAGEMENT/PROBLEM SOLVING/INTRAPRENEURIAL SKILLS COMPONENT

	COMPETENCY		E	VI	SI	N-E	MR
	Management Skills:						
400.	Define the functions of management.	400.	4	3	2	1	3
401.	Demonstrate the ability to set goals or plans for the information systems functions in an office.	401.	4	3	2	1	3
402.	Demonstrate the ability to organize the information systems functions in an office.	402.	4	3	2	1	3
403.	Demonstrate the ability to control the information systems functions in an office.	403.	4	3	2	1	3
404.	Demonstrate the ability to lead or direct the people to attain the goals for information systems in an office.	404.	4	3	2	1	3
405.	Determine the manpower needs for information systems in an office.	405.	4	3	2	1	3
406.	Determine the materials needed for information systems functions in an office, (e.g., hardware, software, media, peripherals, etc.).	406.	4	3	2	1	3
407.	Prepare a budget for the elements of the information systems functions in an office.	407.	4	3	2	1	3
408.	Create, revise, and disseminate the policies, procedures, and methods to be used in the information systems functions in an office.	408.	4	3	2	1	3

COMPETENCY		E	VI	SI	N-E	MR
Research, evaluate, and make recommendations for setting up/ maintaining/upgrading the following information systems functions in an office:						
409. hardware	409.	4	3	2	1	3
410. software	410.	4	3	2	1	3
411. peripherals	411.	4	3	2	1	3
412. media	412.	4	3	2	1	3
413. training	413.	4	3	2	1	3
414. maintenance/service contracts	414.	4	3	2	1	3
415. lease/purchase agreements	415.	4	3	2	1	3
416. Be sensitive to the morale of the individuals in the office.	416.	4	3	2	1	3
417. Monitor the productivity of the information systems functions in an office.	417.	4	3	2	1	3
418. Develop and maintain good working relationships with vendors and distributors outside of the office.	418.	4	3	2	1	3
419. Develop and maintain good working relationships with persons at all levels in the office.	419.	4	3	2	1	4
420. Analyze the productivity and effectiveness of use and design of the information system.	420.	4	3	2	1	3
421. Analyze the cost/benefit justification of the information systems in an office.	421.	4	3	2	1	3
422. Maintain constant evaluation of equipment and network needs at the end user level.	422.	4	3	2	1	3
423. Promote the information systems functions to all levels of the organization.	423.	4	3	2	1	3

COMPETENCY		E	VI	SI	N-E	MR
424. Develop a marketing presentation package to sell to upper management.	424.	4	3	2	1	3
Problem Solving Skills:						
425. Define and describe the problem.	425.	4	3	2	1	4
426. Explain how productivity may be dependent on adequate problem solving in the office.	426.	4	3	2	1	3
427. Analyze the situation to get the basic facts and feelings of the situation.	427.	4	3	2	1	3
428. Break down the problem into the essential elements and issues and clarify goals concerning the problem situation.	428.	4	3	2	1	3
429. Collect relevant/irrelevant data regarding the problem and issues.	429.	4	3	2	1	3
430. Develop and analyze alternate solutions to the problem.	430.	4	3	2	1	3
431. Choose from the options and compare defined goal with the possible ways of solving problem.	431.	4	3	2	1	3
432. Implement the solution.	432.	4	3	2	1	3
433. Create the kind of environment where problems are seen as challenges, not as roadblocks and stumbling stones.	433.	4	3	2	1	3
434. Be sensitive to the areas in an office where problems may arise; (e.g., human, economic, systems).	434.	4	3	2	1	3
435. Communicate the solution to the problem to the people involved, taking into account the factors of verbal and nonverbal communication.	435.	4	3	2	1	4

COMPETENCY		E	VI	SI	N-E	MR
436. Involve the right people in the analysis, implementation, and evaluation of the problem and its solution.	436.	4	3	2	1	4
Intrapreneurial Skills:						
437. Analyze the boundaries of risk which an organization is willing to set for individuals.	437.	4	3	2	1	3
438. Analyze one's personal risk boundaries in order to determine the amount of risk one is willing to take to get the job done.	438.	4	3	2	1	3
439. Define the climate for change in an office environment (e.g., the expectations for, encouragement of, and the willingness of an organization to effect change in itself and in individuals).	439.	4	3	2	1	3
440. Determine the extent to which the individual is willing to accept or reject change within an office environment.	440.	4	3	2	1	3
441. Be aware of the effect of change on others in the organization.	441.	4	3	2	1	3
442. Outline the procedures and components of strategic planning.	442.	4	3	2	1	3
443. Determine the extent to which an individual is encouraged by an organization to develop himself/herself.	443.	4	3	2	1	3
444. Determine the willingness of an organization to develop its human resources (e.g., the use of on-the-job and off-the-job professional development opportunities).	444.	4	3	2	1	3

	COMPETENCY		E	VI	SI	N-E	MR
445.	Take advantage of opportunities to develop one's own capabilities on one's own time.	445.	4	3	2	1	3
446.	Given a problem, use acquired knowledge to demonstrate the ability to analyze and evaluate a situation and present a workable solution in the best interest of the organization.	446.	4	3	2	1	3
447.	Coordinate, set up, and conduct training for all levels of employees within an organization.	447.	4	3	2	1	3
448.	Employ conflict resolution techniques in order to bring about positive outcomes of conflict.	448.	4	3	2	1	3
449.	Demonstrate knowledge of feedback techniques in resolving conflict.	449.	4	3	2	1	3
450.	Utilize negotiating skills in the office.	450.	4	3	2	1	3
451.	Utilize persuasion skills in the office.	451.	4	3	2	1	3

4 = Essential (E): (No doubt about it--A MUST!)
3 = Very Important (VI): (Important, but not essential.)
2 = Somewhat Important (SI): (Nice to have, but ...)
1 = Non-Essential (N-E): (Don't even consider it.)
(MR = Indicates median response of group.)

TECHNOLOGICAL SKILLS COMPONENT

	COMPETENCY		E	VI	SI	N-E	MR
500.	Demonstrate "touch" proficiency in computer keyboard operation.	500.	4	3	2	1	3
	Specifically, "touch" proficiency of:						
501.	Alphabetic keys	501.	4	3	2	1	4
502.	Numeric keys	502.	4	3	2	1	3
503.	Symbolic keys	503.	4	3	2	1	3
504.	Function keys	504.	4	3	2	1	3
505.	10-key pad	505.	4	3	2	1	3
Identify and operate the input elements of computers:							
506.	Keyboards	506.	4	3	2	1	4
507.	OCRs	507.	4	3	2	1	3
508.	Communicating word processors	508.	4	3	2	1	3
509.	Voice processors	509.	4	3	2	1	3
Identify and operate the peripherals of computers:							
510.	Printers	510.	4	3	2	1	4
511.	Phototypesetters	511.	4	3	2	1	2
512.	Modems	512.	4	3	2	1	3
513.	Microfilm	513.	4	3	2	1	2
514.	Copiers	514.	4	3	2	1	3
515.	Facsimile	515.	4	3	2	1	2
516.	Plotters	516.	4	3	2	1	2
Identify and use the following computer recording media:							
517.	Floppy disks	517.	4	3	2	1	4
518.	Hard disks	518.	4	3	2	1	4
519.	CD-ROM	519.	4	3	2	1	3
520.	Cassettes	520.	4	3	2	1	2
521.	Magnetic tape	521.	4	3	2	1	2
522.	Optical disks	522.	4	3	2	1	3

COMPETENCY		E	VI	SI	N-E	MR
Know the importance of the computers itemized below in the office environment:						
523. Mainframes	523.	4	3	2	1	3
524. Minicomputers	524.	4	3	2	1	3
525. Microcomputers	525.	4	3	2	1	4
Identify the factors in the selection of:						
526. storage systems.	526.	4	3	2	1	3
527. retrieval systems.	527.	4	3	2	1	3
528. Evaluate, set up, and maintain a records inventory program (which might include records transfer, records retention, and records destruction).	528.	4	3	2	1	3
529. Demonstrate hands-on operational knowledge of software packages.	529.	4	3	2	1	3
Specifically, the relative importance of the software packages itemized below:						
530. Word processing	530.	4	3	2	1	4
531. Spreadsheet	531.	4	3	2	1	4
532. Database	532.	4	3	2	1	3
533. Graphics	533.	4	3	2	1	3
534. Desktop management	534.	4	3	2	1	3
535. Records management	535.	4	3	2	1	3
536. Inventory control	536.	4	3	2	1	2
537. Telecommunications	537.	4	3	2	1	3
538. Accounting	538.	4	3	2	1	3
539. Electronic mail system	539.	4	3	2	1	3
540. Integrated	540.	4	3	2	1	3
Evaluate, recommend, and justify:						
541. the most appropriate hardware for an office environment.	541.	4	3	2	1	3
542. the most appropriate software for an office environment.	542.	4	3	2	1	3

COMPETENCY		E	VI	SI	N-E	MR
543. Evaluate appropriateness of preventive maintenance and service contracts for automated office hardware and software.	543.	4	3	2	1	3
544. Design the floor plan for hardware configuration in an office environment.	544.	4	3	2	1	3
Coordinate the implementation of:						
545. software.	545.	4	3	2	1	3
546. hardware.	546.	4	3	2	1	3
547. Utilize batch, on-time, real time, time sharing, shared logic, or shared resource processing.	547.	4	3	2	1	3
Recognize and request the appropriate service for:						
548. hardware malfunctions.	548.	4	3	2	1	3
549. software malfunctions.	549.	4	3	2	1	3
550. Determine problems and complete equipment diagnostics through troubleshooting.	550.	4	3	2	1	3
551. Evaluate and compare software packages for hardware environments.	551.	4	3	2	1	3
552. Demonstrate an operational knowledge of electronic communications by developing and testing data communications.	552.	4	3	2	1	3
Indicate the importance of knowledge of electronic communications of:						
553. Data	553.	4	3	2	1	4
554. Text	554.	4	3	2	1	4
555. Voice	555.	4	3	2	1	3
556. Graphics	556.	4	3	2	1	3
557. Networks	557.	4	3	2	1	3
558. Teleconferencing	558.	4	3	2	1	3
559. Electronic mail	559.	4	3	2	1	3

COMPETENCY		E	VI	SI	N-E	MR
560. Identify and define needed features and functions of operations systems software.	560.	4	3	2	1	3
561. Identify and define needed features and functions of applications software.	561.	4	3	2	1	3
562. Identify the legal aspects of an information system; (e.g., information ownership, copyrights vs public domain, licensing).	562.	4	3	2	1	3
Describe the need for:						
563. security of data.	563.	4	3	2	1	3
564. security of facilities.	564.	4	3	2	1	3
Exhibit research skills which demonstrate ability to:						
565. locate vendors	565.	4	3	2	1	3
566. locate documentation	566.	4	3	2	1	3
567. locate new sources and new techniques for implementing, changing, and/or upgrading existing equipment.	567.	4	3	2	1	3
568. Identify ergonomic factors in the selection of equipment.	568.	4	3	2	1	3
Define the strengths/weaknesses and similarities/differences of the following operating systems:						
569. PC-DOS	569.	4	3	2	1	3
570. MS-DOS	570.	4	3	2	1	3
571. CP/M	571.	4	3	2	1	2
572. MP/M	572.	4	3	2	1	2
573. VM	573.	4	3	2	1	2
574. MVS	574.	4	3	2	1	2
575. VSE	575.	4	3	2	1	2
576. DOS	576.	4	3	2	1	3
577. Unix	577.	4	3	2	1	3
578. Xenix	578.	4	3	2	1	2

COMPETENCY		E	VI	SI	N-E	MR
Define the similarities and the differences in standard codes for storing and transferring information:						
579. ASCII	579.	4	3	2	1	3
580. EBCDIC	580.	4	3	2	1	3
581. DIF	581.	4	3	2	1	2
582. DCA	582.	4	3	2	1	2
Utilize methodologies, protocols, and systems for transmission of:						
583. data	583.	4	3	2	1	3
584. text	584.	4	3	2	1	3
585. voice	585.	4	3	2	1	3
586. graphics	586.	4	3	2	1	3
Demonstrate a knowledge of the following communications terminology in information systems:						
587. networks (LANs, WANs)	587.	4	3	2	1	3
588. voice (synthesis, recognition)	588.	4	3	2	1	3
589. electronic mail	589.	4	3	2	1	3
590. teleconferencing	590.	4	3	2	1	3
591. compatibility	591.	4	3	2	1	3
592. connectivity	592.	4	3	2	1	3
593. conversion	593.	4	3	2	1	3
594. protocols	594.	4	3	2	1	3
595. expandability	595.	4	3	2	1	3
596. interface	596.	4	3	2	1	3
597. interactive	597.	4	3	2	1	3
598. editability	598.	4	3	2	1	3
599. processability	599.	4	3	2	1	3
600. Develop, use, and maintain a disaster recovery plan.	600.	4	3	2	1	3
Care for and handle:						
601. computer software.	601.	4	3	2	1	4
602. computer hardware.	602.	4	3	2	1	4
603. computer peripherals.	603.	4	3	2	1	3
604. computer media.	604.	4	3	2	1	3

COMPETENCY		E	VI	SI	N-E	MR
Indicate your opinion of the importance of each of the methodologies itemized below to the person in an Information Systems occupation:						
605. Systems analysis	605.	4	3	2	1	3
606. Flow charting	606.	4	3	2	1	3
607. Project management	607.	4	3	2	1	3
608. Systems design	608.	4	3	2	1	3
609. Software installation	609.	4	3	2	1	3
610. Hardware installation	610.	4	3	2	1	3
611. Modify or change the defaults in a software applications package.	611.	4	3	2	1	3
612. Update technical instructions or procedures for equipment use based on systems changes and/or upgrading.	612.	4	3	2	1	3
613. Interface with all levels of employees in the office to enhance information systems.	613.	4	3	2	1	3
614. Analyze work flow in the office to determine the best use of equipment.	614.	4	3	2	1	3
615. Conduct feasibility studies for the automated office.	615.	4	3	2	1	3
Set up demonstrations and trial usage for:						
616. hardware	616.	4	3	2	1	3
617. software	617.	4	3	2	1	3
618. peripherals	618.	4	3	2	1	3
619. Upload and download between micro and mainframe.	619.	4	3	2	1	3
New statements:						
620. Desktop publishing	620.	4	3	2	1	
621. Network management	621.	4	3	2	1	
622. OS/2	622.	4	3	2	1	
623. VMS	623.	4	3	2	1	
624. ISO Standards	624.	4	3	2	1	
625. Expert systems/AI	625.	4	3	2	1	

As you completed this survey, what level of employee did you have in mind? (Please check the **one** box below which most nearly describes your choice.)

_____ Entry-level administrative support
_____ Mid-level administrative support
_____ Top-level adminstrative support
_____ Technical
_____ Professional
_____ First-line supervisor
_____ Managerial

Please use the space below to add any general comments or suggestions about the contents of the survey, the format of the survey, or the study.

Before you sign, you should know that no individual or institution will be identified in any publicity or publication which may result from this study.

Name______________________________

Address______________________________

____

____

Return the completed survey by **August 7, 1987** Staple the addressed, stamped survey closed and drop in the mail. Thank you!

APPENDIX E

Demographics Datasheet

DEMOGRAPHICS DATASHEET

1. What is your title? (See Attachment 1 for list of titles most often mentioned.)

2. Give a brief (5-word) description of what you do in your present position. (Various descriptions offered.)

3. Years of experience in present position: Average: 3 years.

4. Do you have the CSP certification? 2.8% Yes 95.4% No.

5. What is the name of your present department?

   Most commonly mentioned: Word Processing Center or Department.

6. Educational background:

   45.5% Less than bachelor's   8.0% Master's
   13.5% Bachelor's   12.2% Master's +
   14.6% Bachelor's +   4.2% Doctorate

7. Number of employees in your company/institution?

   6.0% 1 to 19   5.0% 20 to 49   7.3% 50 to 99
   14.2% 100 to 249   14.2% 250 to 499
   13.9% 500 to 999   37.3% 1000+

8. How would your institution be categorized?

   1.9% agricultural   0.2% mining   0.9% construction
   11.8% manufacturing   1.2% trade   28.2% education
   7.3% transportation, communications, public utilities
   33.9% services   6.7% government

9. Does your company/institution use microcomputers?

   95.5% Yes   3.1% No.   If YES, what brand? (More than one answer permitted.)

   31.6% Apple   10.1% AT&T   24.3% Compaq   81.1% IBM
   34.1% IBM Clone   16.9% DEC   11.8% Hewlett Packard
   9.3% Tandy   23.4% Wang   3.6% Data General
   19.5% Macintosh

Other: (most commonly mentioned)

Datapoint Mini
T. I.
Eagle
Televideo
Prime
Toshiba
Radio Shack
Xerox, Advantage Xerox
NCR Work Saver
Osborne
Kaypro
Digital

How many:

15.6% 1 to 10   9.8% 11 to 20   7.9% 21 to 30   61.9% 31+

10. Are the microcomputers interfaced by use of networks?

56.2% Yes 36.2% No. If YES, how are they interfaced?

37.6% local area network (LAN)
26.6% dial-up networks
28.0% dedicated lines
Other:
PBX
Novell
DecNet
Burroughs
Ethernet
Disoss
Syntrex Network
Prime
Satellite
Rolm Telephone Switch
Mainframe connection
Broadband WAN

11. Are the microcomputers connected to a mainframe?

63.3% Yes 31.0% No. If YES, which mainframe?

3.6% Burroughs   1.2% Control Data   2.6% Data General
41.6% IBM   3.4% Honeywell   6.0% Hewlett Packard
12.1% DEC   1.2% NCR   2.2% Sperry
Other:
Wang VS
Amdahl
Prime
Mentor
NBI 64
VAX
Datapoint
T.I.
Convergent Technologies
Wang Mini

12. If your company/institution plans to buy additional microcomputer hardware in the next year, which brand will be purchased?

IBM, IBM compatible or clone, Compaq, Wang, Hewlett Packard, Macintosh, AT&T, DEC, NBI, Apple, Unisys, Leading Edge, Kaypro, Epson, NCR Mini, Toshiba, Xerox, Lanier, Data General.

13. What kinds of software packages is your company/institution currently using?

96.0% word processing 89.8% spreadsheet 67.5% graphics
84.4% database 29.1% inventory 54.6% accounting
42.6% electronic mail 30.8% records management
33.1% integrated 48.3% telecommunications
22.9% desktop management

Other software packages:

Desktop Publishing
CAD/CAM
Insurance-Related
Data Entry
Decision Support
Distribution
Statistical
Project Management
Legal (time management and billing)
Media Conversion
Context Manager

14. Which specific software packages is your company/institution using?

Word Processing: 38.2% WordStar 35.8% WordPerfect
32.8% Displaywrite 3 18.6% Displaywrite 4
4.5% Samna 14.2% Microsoft WORD 10.1% AppleWorks

Other specific software packages:

Multimate
PFS Series
Volkswriter
Mass II
Macintosh
CPT
WPS
Wang
NBI
Smart
Lanier
Decmate
5520
Symphony

Database: 44.7% dBase III 32.0% dBase III+

Other specific database packages:

RB5000
PC File
Power Base
Focus
PFS File/Report
Smart
Data Ease
Enable
R:Base
Paradox
Informix
Wang List Management
Oracle
Lotus
dBase II
DBMS

Spreadsheet: 83.0% Lotus 1-2-3 8.0% AppleWorks

Other specific spreadsheet packages:

- Multiplan
- Supercalc 3/4
- Visicalc
- VP Planner
- Symphony
- 20/20
- Enable
- Smart

Graphics:

- Lotus
- MacDraw, MacPaint
- 35MM Express
- Diagraph
- Smart
- Ventura Publishing
- Signmater
- Printmaster
- Autocad
- Freelance
- Lotus
- Chartmaster
- Graphwriter
- Harvard Pres Graphics
- Energraphics (NBI)
- Diagram Master
- Pictureit
- Symphony

Electronic mail:

- Wang VS/Office
- PROFS Quikcom
- All-in-1 (DEC)
- 3 Com Network
- LAN, Novell
- EMC 2
- DEC Mail
- Easylink
- Mass II & DEC Mail
- Disoss PS/PC
- DGCEO
- Lanier

Integrated: 25.5% Lotus Symphony 5.6% FrameWorks

Other specific integrated software packages:

- PFS FirstChoice
- Smartware
- Jazz
- Excelerator
- Enable
- PDS Series
- Convergent Technologies
- WP Library

Records Management:

- List Processing
- IBM 056
- Wang
- dBase
- RBase
- Reportpack
- NBI Records Processing
- PFS
- Xerox Records Processing
- Syntrex

Accounting:

- BPI
- Informatics
- Real World
- SMS
- Peachtree/Ware
- Fast
- IBM
- Lotus
- Computrac
- DEC
- Visicalc
- CYMA

Telecommunications:

- Crosstalk
- Wang
- MacTerminal
- Easylink
- Kermit
- ProCom
- 2780/3780
- SmartTerm 220/240
- SmartCom
- asynchronous
- bisynchronous
- IBM
- TTY SNA
- SLI Northern Telecomm
- NBI
- IRMA

15. What type of telecommunications equipment or media is your company/institution using?

73.2% Modem 42.0% Facsimile 29.3% Telex 5.9% Satellite
30.5% LAN 6.8% Microwave 7.7% Fiber optics

Other telecommunications hardware:

- PBX
- Tymnet
- Cable TV Network
- Broadband
- Coax
- Leased Lines
- Multiplexers
- Dedicated Lines
- Blackboxes
- Power Line Carrier

16. How is training provided in your company/institution for software/hardware/peripherals?

83.6% In-house 35.4% Outside of company 12.4% Consultants
56.7% On-the-job 2.5% None is provided.

17. Do you have employees working in the area of Information Systems? 67.8% Yes 24.0% No.
(Please see Attachment 1 for list of titles.)

18. Would you hire employees who were trained in the proposed curriculum? 87.5% Yes 2.5% No.

If YES, at what level? 29.1% Clerical 50.8% Professional
43.5% Secretarial 56.7% Technical

Attachment 1

TITLES

(QUESTION 1 from Demographics Datasheet)

Administrative Assistant
Administrative Manager
Administrative Secretary
Administrative Supervisor
Administrative Services, Assistant Vice President
Administrative Services Coordinator
Administrative Services Department Head
Administrative Services Manager/Office Specialist
Administrative Services Specialist
Administrative Services Supervisor
Administrative Support Services Supervisor
Administrative Support Specialist
Administrative Support Supervisor
Administrative Systems Coordinator

Administrator
Administrator, Consultant
Administrator, Information Systems
Administrator, OA and Voice Communications
Administrator, Public Relations
Administrator/Coordinator of Administrative Services
Administrator/Word Processing Manager

Analyst/Designer

Applications Specialist, Information Services

Assistant Administrator
Assistant Director for Office Automation
Assistant Manager, Materials Resources Management
Assistant Manager, Administrative Services
Assistant Manager, Customer Service
Assistant Secretary
Assistant Supervisor, Word Processing
Assistant VP and Manager, General Services
Assistant VP, Administrative Services
Assistant VP, End User Systems
Assistant VP, Human Resources Development
Assistant VP, Word Processing Manager
Assistant VP, Word Processing Supervisor
Assistant VP, Manager, Administrative Services
Assistant Word Processing Manager

Associate Personnel Director

Automation Conversion Coordinator
Automation Specialist

Branch Manager
Branch Manager, Personnel
Branch Marketing Support Manager

Business Supervisor, Information Processing

Chief Word Processing Operator

CoAp Consultant, MIS

Communication Specialist

Computer Graphics Specialist
Computer Operations Manager
Computer Specialist
Computer Systems Supervisor

Consultant, Information Systems Sales Team

Coordinator
Coordinator of Office Information Systems
Coordinator, Word Processing
Coordinator, Word Processing Center
Coordinator,Word Processing Systems

Corporate Word Processing Manager
Corporate Planner

Customer Service Representative
Customer Support Manager

Data Entry Supervisor
Data Processing Analyst
Data Processing Operator Manager
Data Processing Supervisor
Data Processing/Word Processing Operations Manager, Information Processing Department

Data Services Supervisor
Data/Word Processing Manager
Data/Word Processing Coordinator

Department Manager
Department Spokesman, Office Administration

Director, Administrative Services
Director, Bureau of Office Services
Director, Central Communications
Director, Computer Office Production
Director, Graphics
Director, Human Resources Department Support Services
Director, Information Center
Director, Information Systems
Director, Information Systems Control

Director, Management Services
Director, Olsten Office Automation Training Center
Director, Production & Distribution Services
Director, Specifications
Director, Support Services
Director, Training

District Manager, Sales

Documentation Supervisor

Editor

Education Director

Engineering Services Supervisor, Word Processing

Equal Employment Opportunity Officer

Executive Administrator
Executive Assistant
Executive Secretary

Facilities Development and Telecommunications

General Manager, General Management
General Engineer

Group Manager

Human Resources Manager

IRC Manager, Office Information Systems

Information Analyst
Information Manager
Information Specialist

Information Center Consultant
Information Center Director
Information Center Liaison
Information Center Manager
Information Center Specialist

Information Processing Coordinator
Information Processing Secretary
Information Processing Specialist
Information Processing Supervisor
Information Processing Systems Manager

Information Services Supervisor

Information Systems Administrator
Information Systems Coordinator

Information Systems Director
Information Systems Laboratory Technician
Information Systems Manager
Information Systems Program Analyst
Information Systems Supervisor
Information Systems Trainer

Lead Word Processing Operator
Lead Word Processing Specialist

Lead Worker, Correspondence Center

Legal Administrator
Legal Secretary

Management Analyst II, Information Processing
Management Analyst, Administrative Systems Management
Management Assistant
Management Staff Assistant

Manager
Manager, Administrative Services
Manager, Administrative Support
Manager, Automated Office Systems
Manager, Central Word Processing
Manager, Documentation
Manager, Engineering Publications
Manager, General Services
Manager, Information Center
Manager, Information Processing
Manager, Information Processing and Distribution
Manager, Information Processing Support
Manager, Information Processing Systems
Manager, Information Support Services
Manager, Information Systems

Manager, Management Advisory
Manager, Media Conversion

Manager, Office Automation
Manager, Office Information Systems
Manager, Office Services
Manager, Office Support Services
Manager, Office Support Systems

Manager, Proposal/Presentation Services
Manager, Research & Development Services
Manager, Resources & Information Center
Manager, Secretarial Services
Manager, Support Services

Manager, Technical Support
Manager, Text Services, Information Systems
Manager, Training

* Manager, Word Processing
* Manager, Word Processing and Systems Administration
* Manager, Word Processing Center
* Manager, Word Processing, Duplication
* Manager, WP/PC Coordinator, Office Automation Department

Marketing Support Representative
Marketing Representative, Personal Computer Training
Marketing Support
Marketing-Planning Analyst

Microcomputer Support, Technical Services

MIS Director
MIS Manager
MIS Operations Manager

Office Automation Analyst
Office Automation Coordinator
Office Automation Consultant
Office Automation Customer Support
Office Automation Manager
Office Automation Specialist
Office Automation Specialist Trainer, Office Automation
Office Automation Supervisor
Office Automation Support/Trainer
Office Automation Systems
Office Automation Systems Training Manager

Office Coordinator, Management Technology

Office Effect Analyst

Office Manager
Office Manager, Computer Control
Office Manager, Services
Office Manager/Supervisor of Office

Office Services Manager
Office Services Operator
Office Services Supervisor

Office Specialist, Office of the President

Office Supervisor
Office Support Manager

Office Systems Analyst
Office Systems Consultant
Office Systems Manager
Office Systems Specialist

Office Systems Supervisor
Office Systems Support Supervisor

Operations Manager, Word Processing
Operations Officer, Office Automation

PC Manager, Data Processing

Personnel Manager, Branch Office

President

Principal Business Systems Designer

Product Manager, Product Department

Production Coordinator

Prof Coordinating

Program Director, Word Processing

Project Manager

Quality Assistant Office Supervisor
Quality Assurance Manager

Records Manager

Related Assistant Systems Administrator

Research Assistant

Sales Representative
Sales & Marketing Information Technician

Second VP Systems, Corporate Human Resources Development

Secretary
Secretarial Services Supervisor

Senior Business Systems Designer
Senior Computer Applications Analyst
Senior Customer Support
Senior Executive Secretary
Senior Marketing Manager
Senior Marketing Representative, Information Systems
Senior Office Systems Analyst
Senior Planner
Senior Research Associate
Senior Software Specialist
Senior Supervisor, Office Systems & Technology
Senior Systems Analyst
Senior Word Processing Technician

Site Manager, Support Services

Software Specialist

Specialist Technical Planning

Staff Administrator
Staff Office Systems Consultant
Staff Services Administrator
Staff Specialist, Support Services

Supervisor, Administrative Purchasing Services
Supervisor, Communications Center
Supervisor, Computer Services/Systems
Supervisor, Corporate Support Center
Supervisor, Customer Relations and Travel
Supervisor, Department of Communications and Word Processing
Supervisor, DP/WP Center
Supervisor, Engineering Services Department
Supervisor, Headquarters Word Processing Services
Supervisor, Information Systems Unit
Supervisor, Information Systems
Supervisor, Office Services
Supervisor, Office Services Word Processing Center
Supervisor, Office Systems
Supervisor, Personnel Records
Supervisor, Publications
Supervisor, Secretarial Support Services
Supervisor, Secretarial Services
Supervisor, Software Administrative Services
Supervisor, Steno-Reprographics (not a mistake)
Supervisor, Systems Development Support
Supervisor, Technical Procedures
Supervisor, Technical Information Processes
Supervisor, Technical Services
Supervisor, Trust/Word Processing
Supervisor, Word Processing Center or Department
Supervisor, Word Processing/Administrative Support
Supervisor, Word Processing & systems Office Services
Supervisor, Word Processing and Office Automation
Supervisor, Word Processing.Office Equipment
Supervisor, Word Production
Supervisor/Specialist, Information Processing

Support Services Manager
Support Services Officer
Support Services Supervisor
Support Specialist

Systems Administration, Word Processing Manager
Systems Administration Supervisor

Systems Administrator

Systems Administrator, Administrative Services
Systems Analyst
Systems Coordinator
Systems Engineer
Systems Manager
Systems Operations Supervisor
Systems Representative
Systems Trainer

Technical Coordinator
Technical Editor

Telephone Administrator, Administrative Services

Text Processing Manager

Trainer/Coordinator, Information Systems Department
Training Coordinator for Word Processing Technology

Vice President
Vice President, Management Information Center
Vice President, Marketing Development
Vice President, MIS

Voice Communications Analyst

Word Communications Coordinator, General Services

Word Processing Administrator
Word Processing Coordinator
Word Processing Group Leader
Word Processing Lead, Support Services
Word Processing Lead Worker
Word Processing Manager
Word Processing Operator
Word Processing Records Supervisor
Word Processing Specialist
Word Processing Supervisor
Word Processing/PC Center Supervisor
Word Processing Systems Administrator
Word Processing/Business Skills Training Instructor, Office Systems

* Most commonly mentioned title.

APPENDIX F

List of Respondents by State

INFORMATION SYSTEMS OCCCUPATIONAL COMPETENCIES SURVEY

RESPONDENTS BY STATE

STATE	PARTICIPANTS	ROUND 1 RESPONSES	ROUND 2 RESPONSES
Alabama	1	1	-
Alaska	1	1	1
Arizona	25	15	13
Arkansas	1	1	1
California	98	58	41
Colorado	23	19	16
Connecticut	18	11	9
D.C.	10	4	3
Delaware	1	-	-
Florida	57	38	30
Georgia	12	11	8
Hawaii	6	5	4
Iowa	23	17	12
Illinois	47	28	20
Indiana	18	9	6
Kansas	17	13	12
Kentucky	13	9	8
Louisiana	13	10	7

STATE	PARTICIPANTS	ROUND 1 RESPONSES	ROUND 2 RESPONSES
Massachusetts	23	16	10
Maryland	17	12	8
Maine	5	-	-
Michigan	49	29	22
Minnesota	9	4	4
Missouri	52	33	25
Mississippi	5	3	3
Montana	3	3	2
Nebraska	12	8	6
Nevada	7	5	5
New Hampshire	3	2	1
New Jersey	31	18	15
New Mexico	5	3	2
New York	85	56	40
North Carolina	35	22	17
North Dakota	2	1	1
Ohio	43	30	17
Oklahoma	12	7	4
Oregon	32	22	16
Pennsylvania	51	31	20

STATE	PARTICIPANTS	ROUND 1 RESPONSES	ROUND 2 RESPONSES
South Carolina	16	8	7
Tennessee	11	7	4
Texas	105	68	50
Utah	1	-	-
Vermont	1	-	-
Virginia	10	6	6
Washington	2	1	1
West Virginia	3	3	2
Wisconsin	3	3	3
TOTALS	1,017	657	475